Results of forest insect and disease surveys in the NORTHWESTERN REGION of Ontario, 1991

CARRIED OUT BY THE GREAT LAKES FORESTRY CENTRE IN COOPERATION WITH
THE ONTARIO MINISTRY OF NATURAL RESOURCES

R.J. Sajan and H. Brodersen

Miscellaneous Report No. 116

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Ontario Region is one of six regional establishments located across Canada and operated by Forestry Canada. The overall objective of Forestry Canada is to promote the preservation, enhancement and wise use of a healthy, attractive and bountiful forest resource and terrestrial environment for the economic and social benefit of all Canadians. Ontario Region pursues this objective by conducting two major programs: research and technical services and forestry development. Both programs address major problems affecting forest management and the forest environment primarily in Ontario, but because of the transprovincial nature of the forest resource, many elements of our research program are of national significance.

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92-05196/

RESULTS OF FOREST INSECT AND DISEASE SURVEYS IN THE NORTHWESTERN REGION OF ONTARIO 1991

Forest Districts:
Dryden, Fort Frances, Ignace, Kenora,
Red Lake and Sioux Lookout

R. J. Sajan and H. Brodersen

FORESTRY CANADA
ONTARIO REGION
GREAT LAKES FORESTRY CENTRE

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SURVEY HIGHLIGHTS

This report describes the most significant biotic and abiotic conditions that were detected and evaluated during extensive ground and aerial surveys conducted in the Northwestern Region of Ontario in 1991.

Major increases in the total area infested were recorded this season for the eastern spruce budworm, the jack pine budworm and the forest tent caterpillar. The eastern spruce budworm now encompasses some 2,845,785 ha across the region, with increases occurring in all but Dryden District. The total area of budworm-induced whole-tree mortality has now reached some 886,719 ha, approximately a ten-fold increase from last season. The jack pine budworm population exploded in the Kirkness Lake area of Red Lake District, where some 69,903 ha of damage were aerially sketch-mapped compared with only 655 ha of damage last year. This pest was also detected damaging some 1,721 ha in the Ruxton Lake area of Ignace District. The area affected by the forest tent caterpillar expanded to cover approximately 8,740,216 ha, doubling last season's total. The 1992 forecasts for this pest indicate a near collapse in the southern half of the region, but the northern portion of the infestation will persist and possibly expand.

The white pine weevil was evaluated at 26 locations and found to be damaging an average of 2.4% of the leaders, whereas the eastern pine shoot borer, evaluated at the same locations, averaged 3.5% leader damage. Feeding grasshoppers caused a total loss of 8,000 seedlings at the newly established Vermilion River jack pine seed orchard and the Leether Lake family test site.

An average current mortality rate of 1.1% was attributed to Armillaria root rot in 22 juvenile pine stands and the western gall rust was found affecting 15.2% of the trees (9.0% severely) at 21 locations across the region. White birch and balsam poplar leaf diseases were commonly encountered, often causing more than 90% defoliation by late August.

Severe windstorms were a major problem in the region this season. Two separate storms accounted for the destruction of some 207,715 ha of forest. The first devastated a total of 164,685 ha in a single swath extending from the Umfreville Lake area of Kenora District northeast to the Gullrock Lake area of Red Lake District. The second destroyed some 40,790 ha in a narrow band scattered from the Town of Dryden, Dryden District, east along Sioux Lookout–Ignace district boundaries to the Watcomb Lake area of Sioux Lookout District. For the third consecutive year, drought damage was evident throughout the entire region. Although no large continuous areas of damage were detected, numerous small pockets of dying trees, primarily jack pine, were recorded along rocky shorelines and on shallow-soil sites.

(cont'd)

Special surveys included the annual re-evaluation of the three Acid Rain National Early Warning System (ARNEWS) plots in the region and the monitoring of biotic and abiotic problems at the forest tree nursery in Dryden District. The eight selected seed orchards were again evaluated for various pest problems twice during the season and the gypsy moth pheromone trapping program was conducted at the nine provincial parks in the region. At two of the parks, Bluewater in Dryden District and Pakwash in Red Lake District, single male moths were trapped.

As in previous years, pests in this report are categorized as follows:

Major Insects / Diseases

capable of causing serious injury to or death of living trees or shrubs

Minor Insects / Diseases

capable of causing sporadic or localized injury but not usually a threat to living trees or shrubs.

Other Forest Insects / Diseases (Tables)

These tables provide information on two types of pest:

1) those that are of minor importance and have not been known to cause serious damage to forest trees, and
2) those that are capable of causing serious damage but, because of low population levels or for other reasons, did not cause serious damage in 1991.

The authors would like to express their appreciation to personnel of the various Ontario Ministry of Natural Resources (OMNR) district and regional offices, especially the timber sections, to members of the woods industry, and to various private individuals for their excellent cooperation during the 1991 field season.

R.J. Sajan
H. Brodersen

Frontispiece

Typical damage caused by a severe windstorm that occurred on 18 July, resulting in approximately 208,000 ha of damage across Northwestern Region.

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INSECTS

Major Insects

Grasshoppers,
Family Acrididae

The jack pine (*Pinus banksiana* Lamb.) seed orchard at Vermilion River and corresponding family test sites at Leether Lake (north and south), Sioux Lookout District, were established and planted in early May of this year. The A, B and C blocks were planted on schedule at each site. The "D" blocks were not planted until late June.

When the last of the container stock was finally planted in late June, it was immediately set upon by a horde of grasshoppers. Within minutes of being planted, several grasshoppers would descend upon a seedling and quickly strip the bark from the stem, clip the seedling off just above the ground line and then eat the needles. Some 8,000 seedlings were destroyed. The heaviest losses occurred at the Leether Lake North family test site. A standard 150-tree evaluation revealed a loss of 62% of the seedlings in the D block. At the Vermilion River seed orchard, a similar evaluation revealed a 58% loss.

An evaluation was also completed at Leether Lake South in a block planted in May. This survey revealed that less than 1% of the seedlings were damaged by the grasshoppers.

Fall Cankerworm,
Alsophila pometaria (Harr.)

For the fourth consecutive year, the fall cankerworm caused severe defoliation of ornamental Manitoba maples (*Acer negundo* L.) throughout the town of Sioux Lookout in Sioux Lookout District. Defoliation levels varied from 20 to 90% on ornamentals within the town. Defoliation levels of 75% were also recorded this year on ornamentals in the town of Hudson, located west of the town of Sioux Lookout.

For the third consecutive year, similar levels of defoliation were recorded on Manitoba maples in the towns of Kenora (Kenora District), Dryden (Dryden District) and Fort Frances (Fort Frances District).

Eastern Spruce Budworm,
Choristoneura fumiferana (Clem.)

Provincial Situation

For the third consecutive year, there was an increase in the total area of moderate-to-severe defoliation of spruce–fir stands across the province caused by the eastern spruce budworm. The defoliation mapping this season revealed some 9,065,781 ha of damage, an increase of 2,282,520 ha over the 1990 level. The majority of the damage occurred in the Northwestern and North Central regions of Ontario; however, the leading eastern edge of the outbreak now extends into the northwestern part of Wawa District, Northeastern Region, and the western portion of Hearst District, Northern Region. Small, scattered pockets were reported this season from the Sudbury and North Bay districts, also in Northeastern Region (Fig. 1).

In southern Ontario, some 11,640 ha of moderate-to-severe defoliation occurred in Algonquin Park District, Algonquin Region. Small, scattered pockets were also reported in the Lindsay, Maple and Huronia districts of Central Region and Wingham District of Southwestern Region.

The area within which whole-tree mortality is occurring continues to increase, with this year's total standing at some 3,736,379 ha, an increase of 638,190 ha from 1990. The largest increases were recorded in the Nipigon, Terrace Bay and Thunder Bay districts in North Central Region.

Northwestern Region

The total area of moderate-to-severe defoliation of spruce–fir stands caused by this pest increased throughout the region for the first time in 3 years. A total of 2,845,785 ha was aerially sketch-mapped this season, an increase of some 97,961 ha, with increases occurring in all but Dryden District. Table 1 compares the total area defoliated and the yearly changes in the total area infested, by district, in 1990 and 1991.

The largest areas of increase, 70,582 and 66,193 ha, respectively, occurred in the Red Lake and Sioux Lookout districts. In Red Lake District, the expansion occurred in the Wenasaga–Bluffy

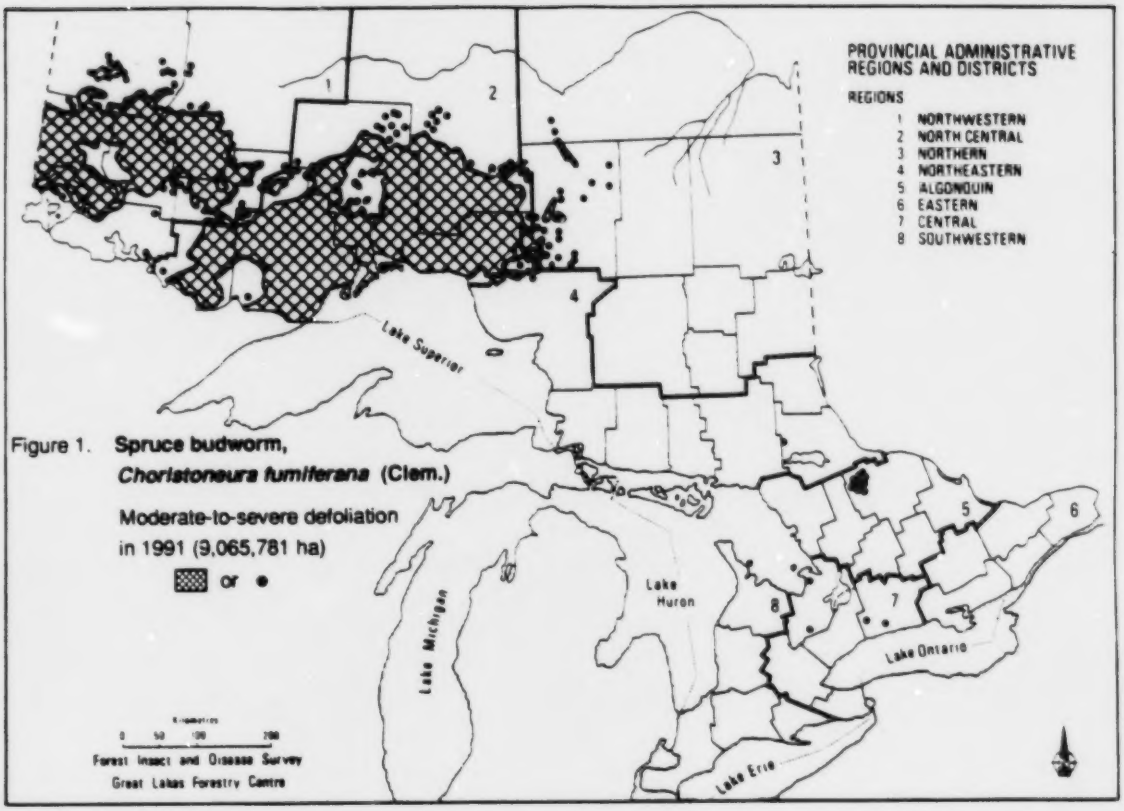


Figure 1. **Spruce budworm, *Choristoneura fumiferana* (Clem.)**
Moderate-to-severe defoliation in 1991 (9,065,781 ha)
or •

lakes area, near Red Lake and in the Pineneedle–Sydney lakes area. In Sioux Lookout District, the majority of the expansion occurred north and east of Lac Seul. A marked increase also occurred in Fort Frances District, where two new pockets of infestation occurred in areas that had been virtually free of this pest for the past 3 years. The first pocket lies east of the northern end of Lower Manitou Lake and the second lies west of Shoal and Bad Vermilion lakes. Both are in the eastern portion of the district (Fig. 2).

Table 1. Total area of moderate-to-severe defoliation by the eastern spruce budworm in the Northwestern Region of Ontario in 1990 and 1991, and the change for each district since 1990.

	Area of moderate-to-severe defoliation (ha)		
District	1990	1991	Change
Dryden	815,547	700,085	–115,462
Fort Frances	6,720	39,830	+33,110
Ignace	314,071	351,536	+37,465
Kenora	859,395	865,468	+6,073
Red Lake	228,747	299,329	+70,582
Sioux Lookout	523,344	589,537	+66,193
Total	2,747,824	2,845,785	+97,961

Egg-mass sampling for the purpose of forecasting 1992 defoliation levels was completed at 133 locations across the region. A complete list of locations and forecasts are listed in Appendix 1. Comparisons of the egg-mass densities from 1990 and 1991 are presented in Table 2. In all, 97 locations were compared to the previous season, and 42 showed increases in egg-mass densities. An average of 335.4 egg masses per 9.29 m^2 of foliage was recorded. There was an overall decrease of 6% in the actual number of egg masses per sample across the region; however, this slight reduction does not

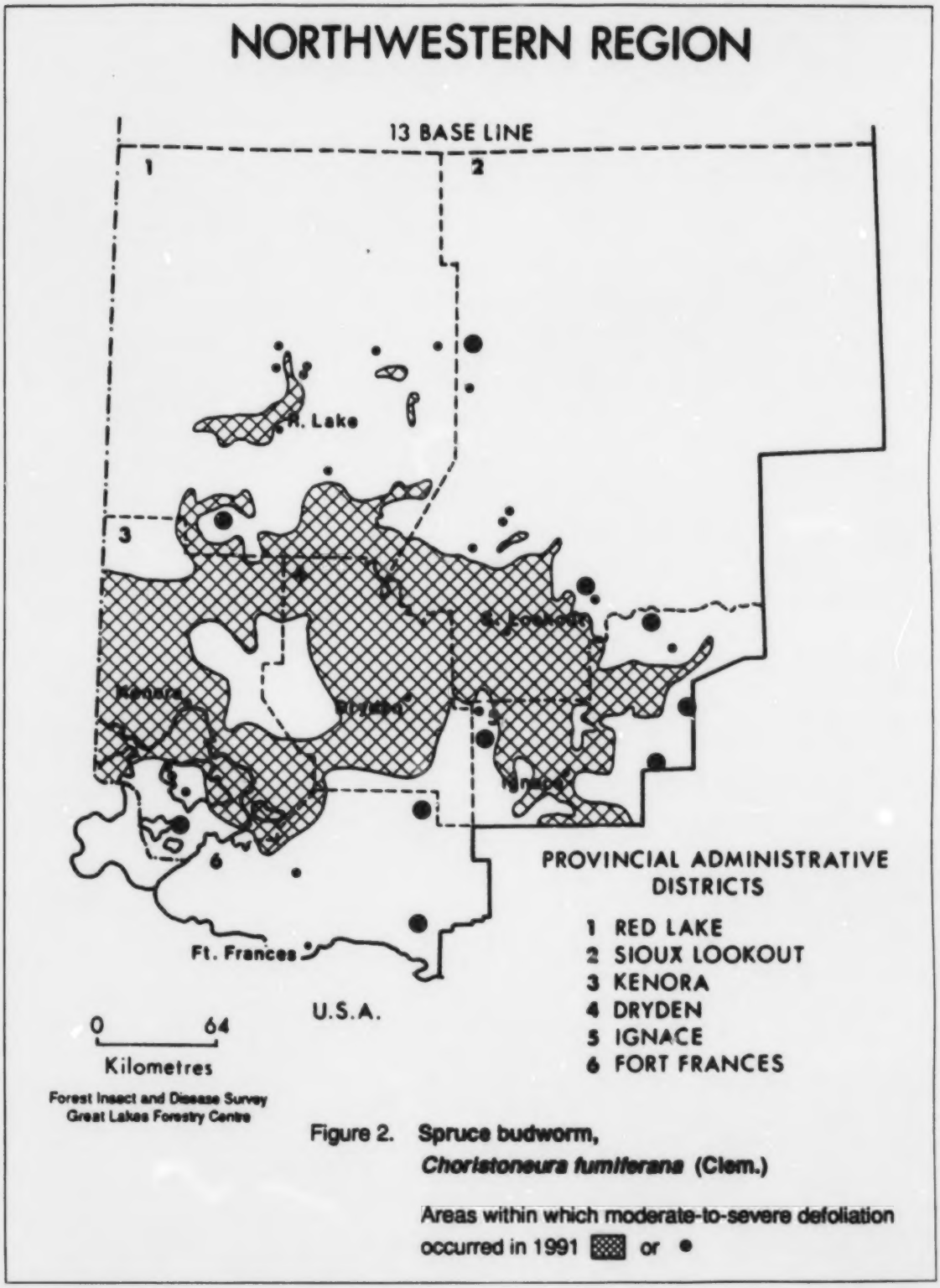


Figure 2. **Spruce budworm, *Choristoneura fumiferana* (Clem.)**

Table 2. Comparison of eastern spruce budworm egg-mass densities at 97 locations in the Northwestern Region of Ontario in 1990 and 1991.

District	Number of locations compared	Number of locations with increases	Average egg-mass density per 9.29 m^2 of foliage 1990	1991	% change
Dryden	16	7	347.7	455.8	+31
Fort Frances	11	2	247.4	142.8	–42
Ignace	19	8	265.3	249.4	– 6
Kenora	17	8	453.6	357.8	–21
Red Lake	15	7	450.1	443.2	– 2
Sioux Lookout	19	10	359.2	326.5	– 9
Over all	97	42	353.8	335.4	– 6

necessarily indicate a decline in the infestation. It should also be noted that the large decrease (42%) recorded in Fort Frances District represents a comparison between only 11 areas infested and sampled in both 1990 and 1991. It does not reflect the areas of expansion recorded this season, such as at Shoal Lake, where counts averaged 1,508 egg masses per 9.29 m^2 of foliage.

Spruce budworm-induced whole-tree mortality continues to spread throughout the infested areas in the region. Many of the balsam fir (*Abies balsamea* [L.] Mill.) stands in the southern portion of the region have sustained damage levels that exceed 95%. This season, some 886,719 ha were mapped, an increase of 97,679 ha from 1990 (Fig. 3). However, due to insufficient aircraft time, not all of the region was mapped. These exclusions included a suspect area in the eastern portion of Kenora District and the entire southern portion of Ignace District. The southern part of Ignace District has been experiencing whole-tree mortality for several years and it is doubtful if there is much change from last season in the area affected. The eastern portion of Kenora District, however, constitutes an area of recent mortality and expansion was anticipated. Table 3 compares the total area of whole-tree mortality and the yearly changes, by districts, for 1990 and 1991.

In the northern half of the region, where the majority of the recent mortality is occurring, stands with a high component of balsam fir are averaging 10% mortality. The expansion in this part of the region occurred north of a line from north of Umfreville Lake in Kenora District, eastward to the southern shore of Lac Seul in Dryden District, then northeast to the Lake of Bays area in Sioux Lookout District. If the current budworm infestation in the northern portion of the region persists, large tracts of whole-tree mortality can be expected in the near future. A total of 20 mortality plots have been established throughout the areas of more recent mortality and the complete list of locations and data collected is presented in Table 4.

Table 3. Total area of eastern spruce budworm-induced whole-tree mortality in the Northwestern Region of Ontario in 1990 and 1991, and the change since 1990.

District	Area of whole-tree mortality (ha) 1990	1991	Change
Dryden	188,129	197,858	+9,729
Fort Frances	341,938	341,938	0
Ignace	127,268	140,076	+12,808
Kenora	106,454	137,083	+30,629
Red Lake	8,522	31,824	+23,302
Sioux Lookout	16,729	37,940	+21,211
Total	789,040	886,719	+97,679

Jack Pine Budworm,
Choristoneura p. pinus Free.

There was a marked increase in the total area within which moderate-to-severe defoliation of jack pine occurred in the region this season. Approximately 71,644 ha of damage were aerially sketch-mapped, compared with only 665 ha in 1990 (Fig. 4).

The majority of the damage (69,903 ha) occurred in the north-central portion of Red Lake

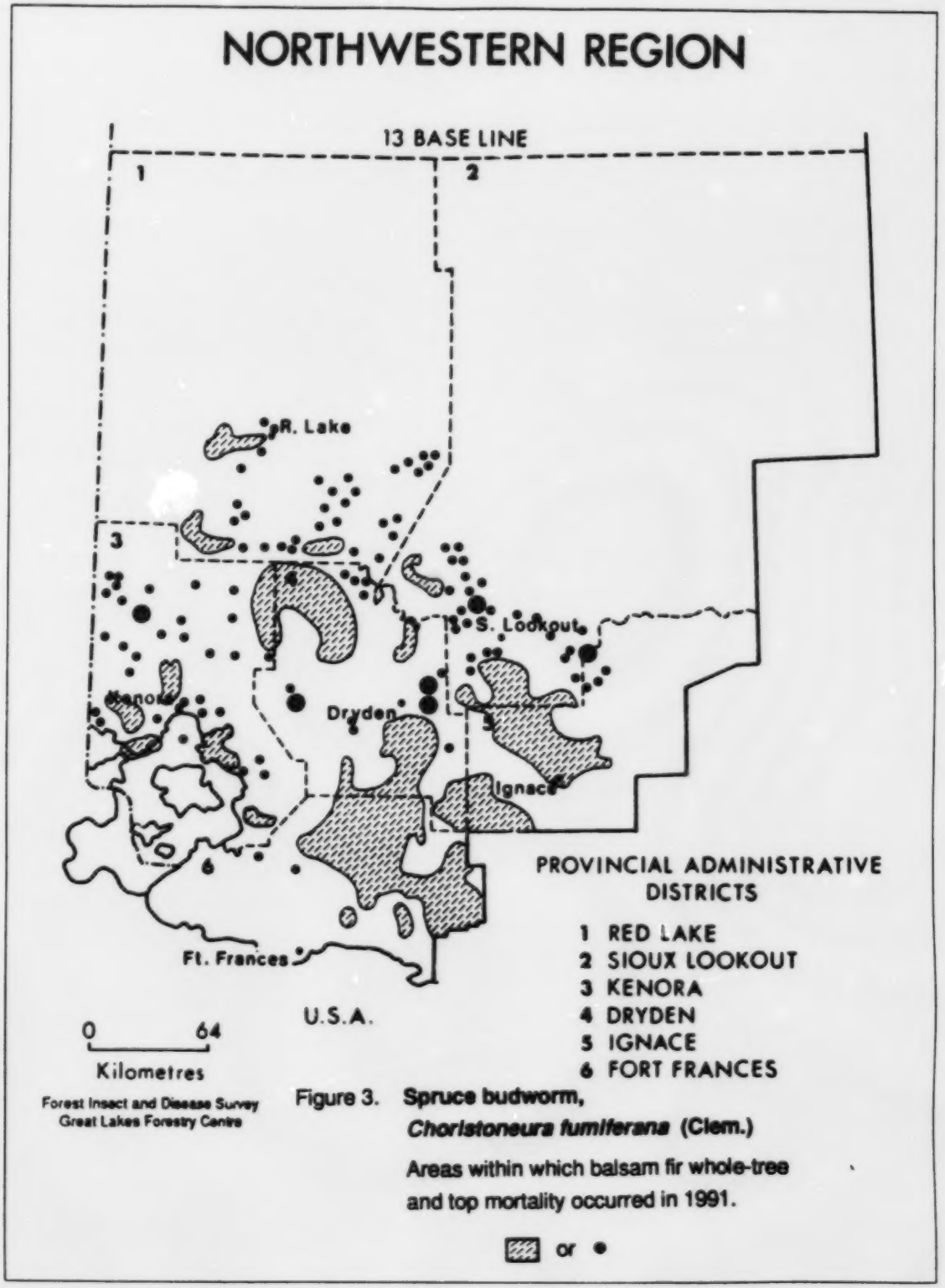


Figure 3. **Spruce budworm, *Choristoneura fumiferana* (Clem.)**

Areas within which balsam fir whole-tree and top mortality occurred in 1991.

District, the same general area in which population levels of this pest have persisted for some 6 years. The damage extended from the western end of Nungesser Lake west to Wagin Lake and from the northwestern end of Little Vermilion Lake north to Prideaux Lake. Throughout much of this area, the jack pine is mature to overmature and shows obvious signs of previous jack pine budworm damage (e.g., dead tops).

In Ignace District, a new pocket of damage, comprising some 1,721 ha, was detected in the Ruxton–Dasent lakes area. This pocket extends across the Ignace–Thunder Bay district boundary to encompass an additional 870 ha, bringing the total size of the infestation to 2,591 ha.

The final 20 ha reported occurred in the Goodie Lake area of Sioux Lookout District. This is the second year of damage in this area and the pocket has doubled in size since last season. The Sioux Lookout District office of OMNR has assigned the infested stands in the Goodie Lake area to be clearcut in the winter of 1991–1992.

Elsewhere in the region, small numbers of larvae were encountered at five scattered locations, four in Sioux Lookout District and one in Red Lake District. In Sioux Lookout District, small numbers of larvae were detected in mature jack pine at the northern ends of Cat and Kapikik lakes and in 2- to 3-m jack pine regeneration along the Stanzhikimi Lake Road and south of Skurban Lake. In Red Lake District, similar levels were found in semnimature jack pine at Goose Lake.

Egg-mass sampling for the purpose of forecasting possible defoliation levels for 1992 was conducted at 35 locations across the region. A complete list of these locations and the results are presented in Appendix 2. Moderate-to-severe defoliation is forecast in Red Lake District from the samples collected within the area defoliated in 1991, whereas light or less defoliation is forecast outside the current infested area. Moderate-to-severe defoliation is also forecast for the Ruxton–Dasent lakes area of Ignace District and the Goodie Lake area in Sioux Lookout District.

Table 4. Data collected from 21 eastern spruce budworm mortality plots in the Northwestern Region of Ontario in 1990 and 1991 (counts based on an examination of 100 dominant and codominant trees at each location).

District (Location)	Tree species	Tree mortality (%) 1990	1991
Dryden District			
Ingall Lake	bF	66	84
Minnehaha Lake	bF	48	57
Portal Lake	bF	44	78
Aerobus Lake	bF	61	90
Thunder Lake	bF	5	21
Highway 502	bS	13	35
Ignace District			
Abamategwia Lake[a]	bF	87	–
Dimple Lake[a]	bF	82	–
Pluto Lake	bF	49	90
Revell Township	bS	0	0
Isley Township	bF	50	83
Dewan Township	bF	4	7
Cecil Lake	bF	68	99
Sowden Lake – west side[b]	bF	–	97
Kenora District			
Forge Township	bF	63	95
Sand Lake[b]	bF	–	24
Red Lake District			
Highway 105, Ear Falls[b]	bF	–	2
Windfall Road[b]	bF	–	16
Pakwash Prov. Park[b]	bF	–	0
Sioux Lookout District			
Ojibway Prov. Park	bF	0	1
Pickerel Township	bF	1	14

[a] plots not tallied in 1991

[b] new plots established in 1991

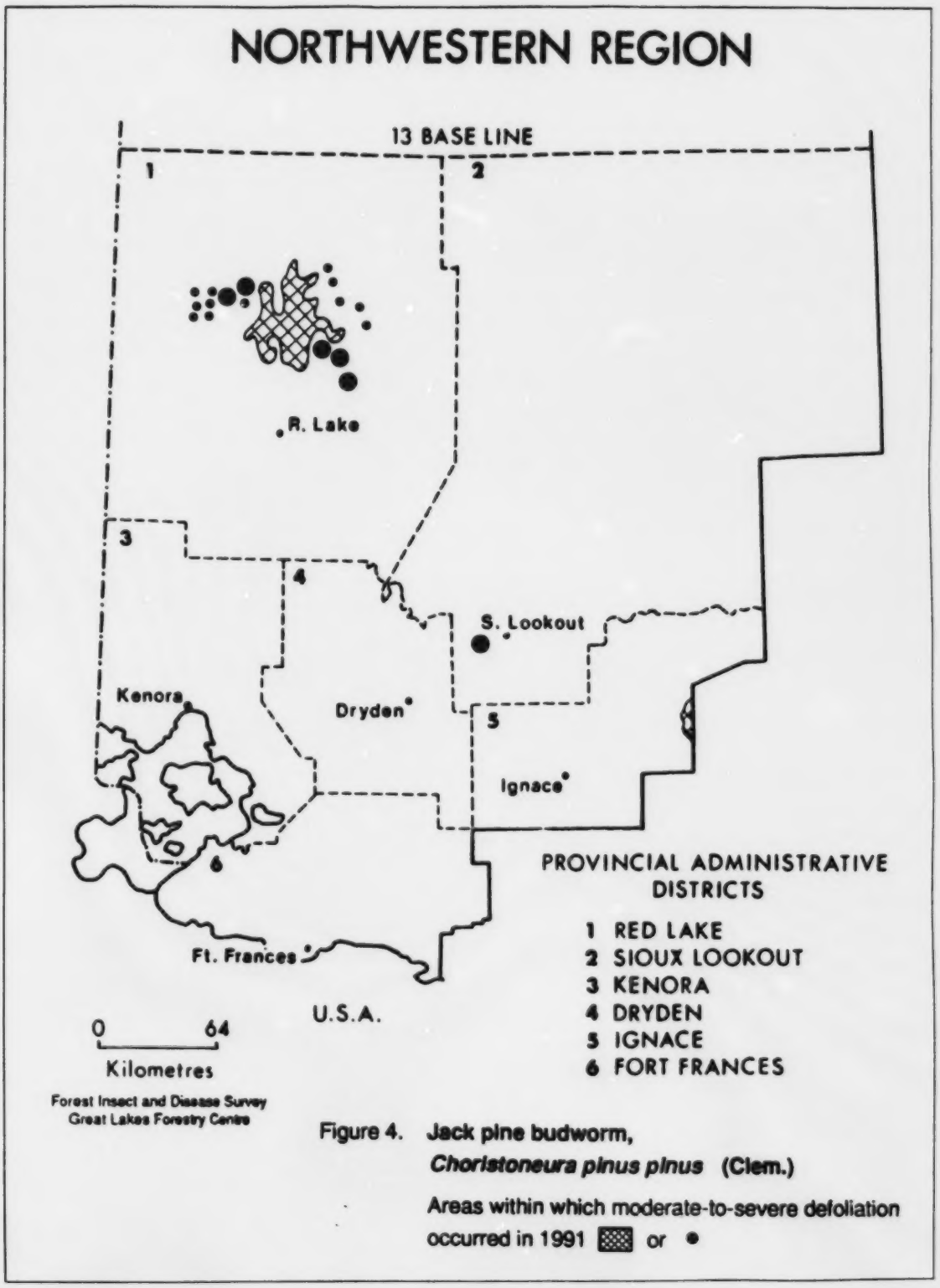


Figure 4. **Jack pine budworm, *Choristoneura pinus pinus* (Clem.)**

Areas within which moderate-to-severe defoliation occurred in 1991 ▨ or ●

Eastern Pine Shoot Borer,
Eucosma gloriola Heinr.

Jack pine regeneration was examined at 26 locations across the region to detect damage caused by this shoot borer. At all locations, only the main leader was evaluated. The survey revealed that an average of 3.5% of the leaders had been attacked. This level of damage was lower than the overall average of 4.9% reported in 1990. The highest incidence rate (11.0%) was recorded on regeneration in the southwestern portion of Ignace District. A complete list of the locations and the results of the survey are presented in Table 5.

Table 5. Damage caused by the eastern pine shoot borer at 26 locations in the Northwestern Region of Ontario in 1991 (counts based on an examination of 150 randomly selected jack pine trees at each location).

District (Location)	Average height of trees (m)	Estimated number of trees per ha	Estimated area of stand (ha)	Leaders attacked (%)
Dryden District				
Snake Bay Road – km 6	3.0	2,500	8	3.0
– km 33	4.5	1,000	1	2.0
– km 42	4.4	2,100	4	4.0
Eton–Rugby Road – km 27	3.5	1,450	9	9.0
Fort Frances District				
Highway 502 – Kenozhe Road	3.9	900	2	1.0
Mount Road	1.9	5,200	6	6.0
Glengarry Road – km 16	4.9	1,000	4	3.0
– Turtle River	4.0	1,300	1	3.0
Ignace District				
Sowden Lake Road	3.5	4,200	15	4.0
Megikon Road – km 8	2.1	4,800	10	4.0
– km 37	1.7	4,500	20	6.0
Highway 622 – Sandbar Lake	2.3	5,400	20	11.0
– Atikokan border	1.9	4,400	15	11.0
Kenora District				
McMeeken Township	4.0	2,500	2	2.0
English River Road	4.0	2,200	2	8.0
Desmond Township	3.4	4,100	4	1.0
Ulster Lake Road – km 2	2.9	1,330	2	0.0
– km 9	2.3	7,500	3	1.0
Red Lake District				
Nungesser Lake Road – Coli Lake	2.3	5,200	20	2.0
– Coli Lake	2.2	5,400	25	1.0
– Anderson Lake	2.0	5,200	15	1.0
Wegg Lake Road	1.9	4,600	10	3.0
Schromemi Road	2.7	3,000	20	5.0
Sioux Lookout District				
Highway 516 – Fowler Lake Road	1.6	5,200	12	5.0
Stanzhikimi Lake Road – km 4	2.5	4,600	15	5.0
– km 6	1.1	5,000	20	3.0

Pales Weevil,
Hylobius pales (Hbst.)

A single incidence of damage caused by this root-collar weevil occurred in an 18-ha clearcut along the Burma Lake Road in Sioux Lookout District. The stand, which formerly consisted of mature red pine (*Pinus resinosa* Ait.), was clearcut in the late winter of 1991 and the area was replanted to red pine the following spring. Adult weevils were attracted to the freshly cut pine stumps and began feeding on the seedlings. An evaluation of the site confirmed that 20% of the seedlings had died as a result of adult weevils feeding on the bark and cambium of the main stems, thus girdling the seedling.

Forest Tent Caterpillar,
Malacosoma disstria Hbn.

For the fifth consecutive year, the forest tent caterpillar infestation continued to expand across the region, and most of the region is now infested. Aerial sketch-mapping revealed that a total of some 8,740,216 ha were defoliated, doubling last year's figure of 4,072,857 ha. The largest increase occurred in Sioux Lookout District, where some 3,386,280 ha were mapped, an eight-fold increase from 1990.

Defoliation of hardwoods, primarily trembling aspen (*Populus tremuloides* Michx.), was mapped, with minor exceptions, across virtually all of the Dryden, Fort Frances, Ignace and Kenora districts. The extreme northern portion of Sioux Lookout District, north of Cat Lake, was free of infestation, as was the entire western half and northern portion of the Red Lake District (Fig. 5). There were small, scattered pockets of damage north of the infestation in the Trout and Nungesser lakes area of Red Lake District and Cat Lake in Sioux Lookout District. Table 6 summarizes the total area infested, by district, since the outbreak of the infestation in 1987.

Significant numbers of immature larvae were observed starving to death at numerous locations throughout the infestation. This was a direct result of the vast numbers of caterpillars present and the complete defoliation of all deciduous trees and shrubs in the areas. At many locations, the immature larvae attempted to consume foliage of non-preferred hosts. This was the case at two of the white spruce (*Picea glauca* [Moench] Voss) seed orchards in the region, where significant current defoliation levels occurred. The flesh fly (*Arachnidomyia aldrichi* [Park.]), a common pupal parasite that seriously affects population levels of the forest tent caterpillar, was also recorded at very high populations levels especially throughout the southern portion of the infestation. These two factors may help bring about the final collapse of the current infestation.

Egg-band counts used to forecast defoliation levels for 1992 were completed at 24 locations throughout the infestation (Fig. 6). The infestation is expected to decline within most of Fort Frances District and the southern halves of the Dryden and Kenora districts. Similar declines are forecast for the western end of the Ignace District and the extreme southwestern portion of Sioux Lookout District. Throughout the northern half of the region, the infestation will persist and possibly expand. A complete list of locations sampled and the forecasts for 1992 are presented in Table 7.

Sawyer Beetles,
Monochamus spp.

Adult sawyer beetles feeding on the elongating shoots of residual jack pine and black spruce (*Picea mariana* [Mill.] B.S.P.) trees along the edge of cutovers accounted for twig and whole-tree mortality in the Sioux Lookout and Red Lake districts. Whole-tree mortality along the edge of the cutovers can vary from a single line of trees in some cases to strips 10 to 15 trees deep in a continuous band around the cutover. This type of damage is most often encountered in new cutovers once the stands that have been open for a year or two after cutting exhibit sharp declines in the incidence of damage.

In Red Lake District, this damage was detected north of Little Vermilion Lake along a new road right-of-way, southwest of Trout Lake at Ranger Lake and south of Alord Lake along the Jamie Mine Road.

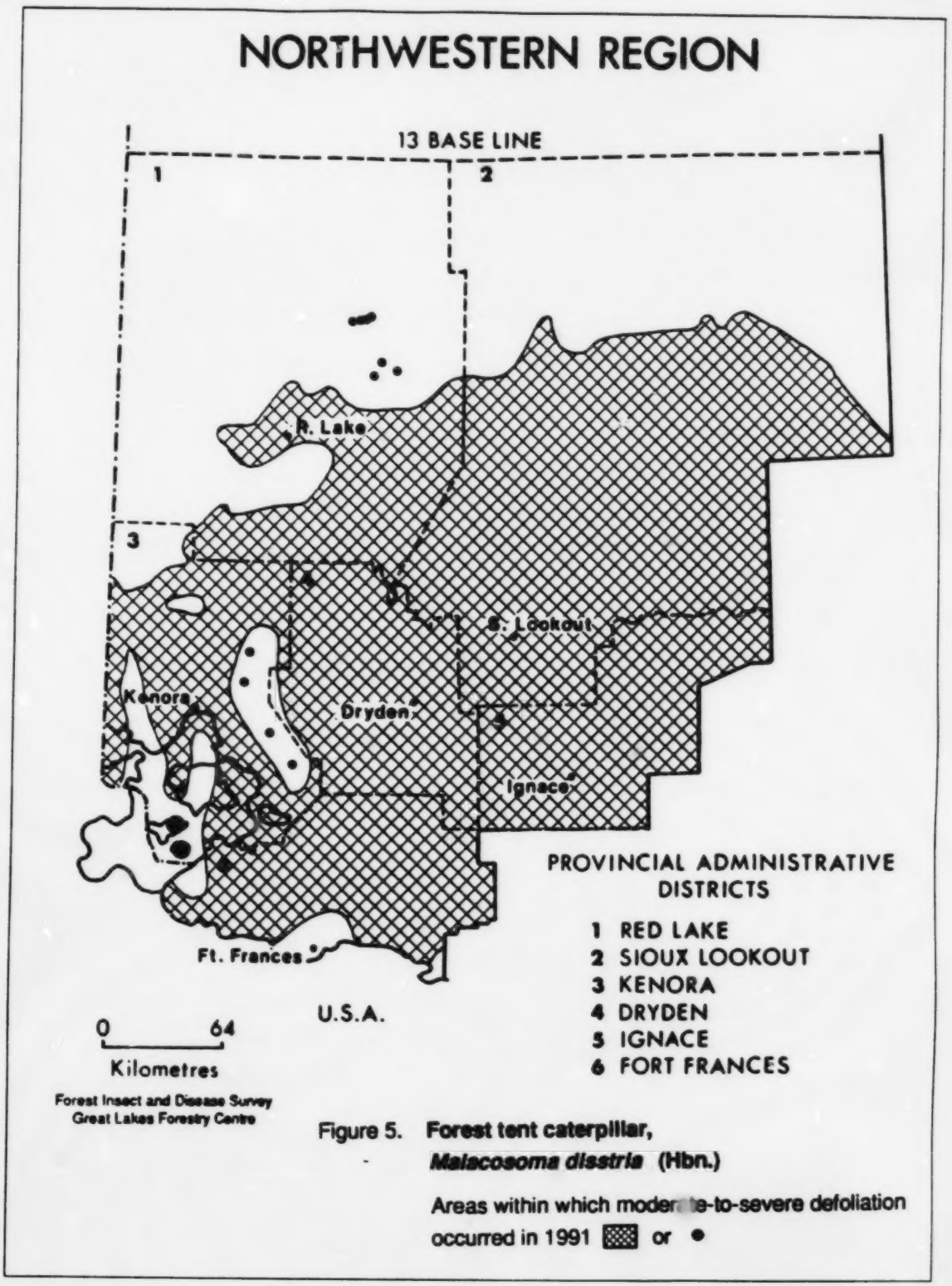


Figure 5. **Forest tent caterpillar, *Malacosoma disstria* (Hbn.)**

Areas within which moderate-to-severe defoliation occurred in 1991 ▩ or ●

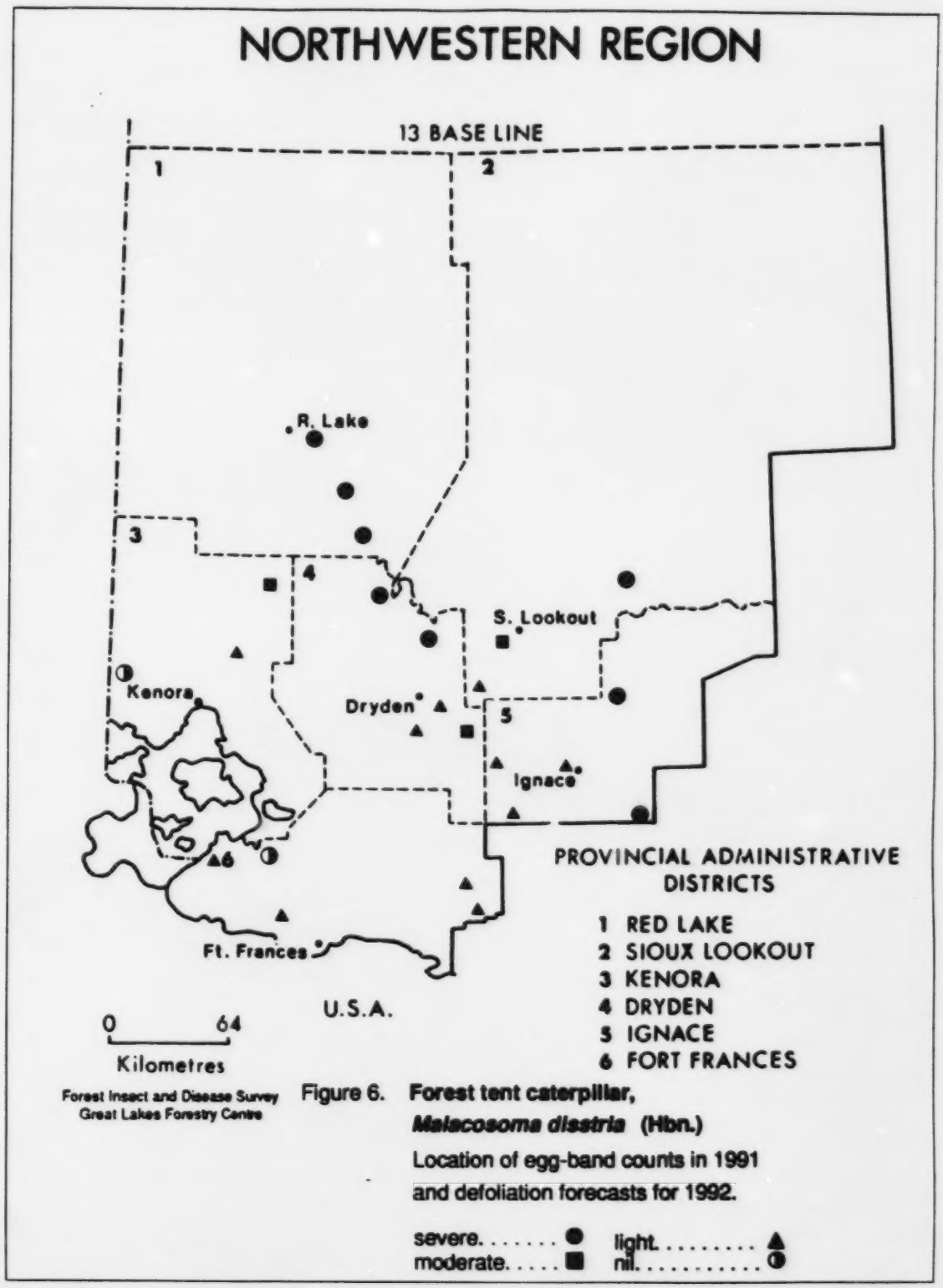


Figure 6. **Forest tent caterpillar, *Malacosoma disstria* (Hbn.)**
Location of egg-band counts in 1991 and defoliation forecasts for 1992.

Table 6. Area of moderate-to-severe defoliation caused by the forest tent caterpillar in the Northwestern Region of Ontario from 1987 to 1991.

District	Area of moderate-to-severe defoliation (ha)				
	1987	1988	1989	1990	1991
Fort Frances	5,025	257,305	1,048,876	1,080,680	1,056,860
Kenora	0	15,070	553,487	965,400	1,024,036
Dryden	0	610	564,902	974,160	1,185,900
Ignace	0	0	12,403	577,960	1,146,300
Sioux Lookout	0	0	450	436,703	3,386,280
Red Lake	0	0	0	37,954	940,840
Total	5,025	272,985	2,180,118	4,072,857	8,740,216

Table 7. Forest tent caterpillar egg-band counts on trembling aspen at 24 locations in the Northwestern Region of Ontario in 1991 and infestation forecasts for 1992.

District (location)	Average DBH of sample trees (cm)	Average number of egg bands per tree	Infestation forecast for 1992
Dryden District			
Dore Lake Road	10.0	2	Low
Sunstrom Township	12.0	7	Severe
Pickerel Creek	13.0	9	Severe
Wabigoon	11.0	1	Low
Snake Bay Road	10.0	4	Moderate
Fort Frances District			
Highway 11 – Price Creek	12.0	1	Low
Morson Seed Orchard	10.0	1	Low
Glengarry Road	10.0	2	Low
Kingsford Township	10.0	4	Low
Caliper Lake	10.0	0	Nil
Ignace District			
Highway 17 – west of Ignace	12.0	1	Low
– east of Basket Lake Road	16.0	2	Low
– Lodge Lake	12.0	7	Severe
Highway 642 – west of Highway 599	12.5	23	Severe
Highway 622 – west of Bending Lake	12.0	1	Low
Kenora District			
Jones Road	10.0	1	Low
Highway 17, Manitoba border	10.0	0	Nil
Tide Lake	9.0	2	Moderate
Red Lake District			
Highway 804 – km 12	14.5	76	Severe
Pakwash Prov. Park	13.0	52	Severe
Highway 125 – south of Balmertown	14.5	47	Severe
Sioux Lookout District			
Highway 516 – Fowler Lake Road	11.0	41	Severe
Highway 664 – Vermilion Lake	16.0	8	Moderate
Highway 72 – Big Sandy Lake	15.5	4	Low

In Sioux Lookout District, similar damage was recorded on the fringes of new cutovers at Yett Lake, south of Stanzhikimi Lake and east of Kabikwatik Lake. Juvenile white spruce, less than 1 m tall, planted north of the Vermilion River were found to be heavily damaged by this pest this season. Large feeding scars were evident on the branches and main stems, and branch and whole-tree mortality may result.

Additional information on this pest may be found later in this report in the section "Annual Seed Orchard Surveys".

Jack Pine Sawfly,
Neodiprion pratti banksianae Roh.

This sawfly was commonly observed on fringe jack pine at numerous locations in the Red Lake, Sioux Lookout and Ignace districts. Defoliation was detected as far north as Cat Lake in Sioux Lookout District. Although the incidence of the pest was high, defoliation levels were insignificant (usually less than 1%) at all sites examined.

In Devlin Township, Fort Frances District, similar damage levels were noted on the 10- to 20-m-tall jack pine. The exception was a single 10-ha pocket of 17-m trees on the southern shore of Lake Despair, along Highway 613, which sustained an average of 5% defoliation on 73% of the trees.

Aspen Leafblotch Miner,
Phyllonorycter ontario (Free.)

The presence of this leafminer continues to be a widespread problem on trembling aspen across the entire region. The incidence of trees attacked at any given location was usually very high, averaging 75% or more, but the actual foliar damage varied considerably. The heaviest levels of foliar damage were often encountered on aspen regeneration less than 2 m in height.

The highest incidence levels were observed throughout the southern portions of the Sioux Lookout and Ignace districts. Stands of various age and size classes were often found with an incidence level of 100%, with foliar damage levels exceeding 75%. This is the second consecutive year that severe browning of aspen foliage by this pest has occurred throughout Ignace District. In the Kenora and Dryden districts, immature 5- to 10-m stands of aspen observed along the Highway 17 corridor averaged 40% foliar damage on 100% of the trees.

In Fort Frances District and the southern portion of Red Lake District, foliar damage was usually much lower, averaging less than 20% at most locations.

White Pine Weevil,
Pissodes strobi (Peck)

Twenty-six areas of jack pine regeneration were surveyed for this pest across the region (Fig. 7). An average of 2.4% of all leaders examined were found to be damaged, an infestation level that was generally lower than in previous years. The most significant damage surveyed occurred near Sandbar Lake in Ignace District, where damage levels reached 10.0%. The complete list of locations surveyed and the results are presented in Table 8.

An insect that is considered an important predator of the white pine weevil (*Lonchaea* sp.) was recovered from infested leaders collected at nine of the stands surveyed. Three stands were located in each of the Red Lake and Sioux Lookout districts and one in each of the Fort Frances, Ignace and Kenora districts.

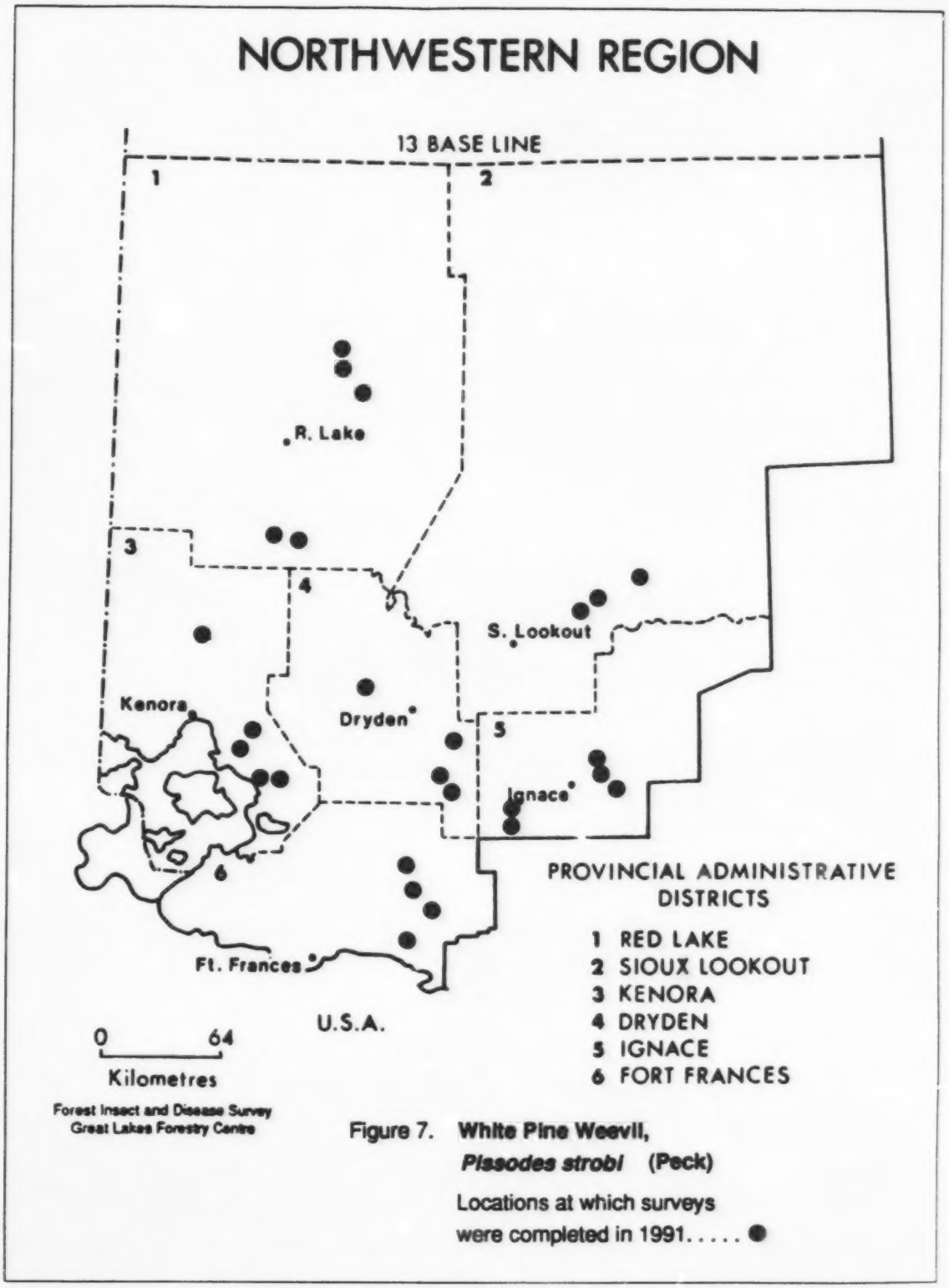


Figure 7. **White Pine Weevil, *Pissodes strobi* (Peck)**

Locations at which surveys were completed in 1991. . . . . ●

Table 8. Damage caused by the white pine weevil at 26 locations in the Northwestern Region of Ontario in 1991 (counts based on an examination of 150 randomly selected jack pine trees at each location).

District (Location)	Average height of trees (m)	Estimated number of trees per ha	Estimated area of stand (ha)	Leaders attacked (%)
Dryden District				
Snake Bay Road – km 6	3.0	2,500	8	3.0
– km 33	4.5	1,000	1	0.0
– km 42	4.4	2,100	4	1.0
Eton–Rugby Road – km 27	3.5	1,450	9	2.0
Fort Frances District				
Highway 502 – Kenozhe Road	3.9	900	2	6.0
Mount Road	1.9	5,200	6	3.0
Glengarry Road – km 16	4.9	1,000	4	4.0
– Turtle River	4.0	1,300	1	0.0
Ignace District				
Sowden Lake Road	3.5	4,200	15	1.0
Megikon Road – km 8	2.1	4,800	10	2.0
– km 37	1.7	4,500	20	5.0
Highway 622 – Sandbar Lake	2.3	5,400	20	10.0
– Atikokan border	1.9	4,400	15	5.0
Kenora District				
McMeeken Township	4.0	2,500	2	0.0
English River Road	4.0	2,200	2	5.0
Desmond Township	3.4	4,100	4	0.0
Ulster Lake Road – km 2	2.9	1,330	2	0.0
– km 9	2.3	7,500	3	0.0
Red Lake District				
Nungesser Lake Road – Coli Lake	2.3	5,200	20	4.0
– Coli Lake	2.2	5,400	25	3.0
– Anderson Lake	2.0	5,200	15	2.0
Wegg Lake Road	1.9	4,600	10	4.0
Schromeml Road	2.7	3,000	20	4.0
Sioux Lookout District				
Highway 516 – Fowler Lake Road	1.6	5,200	12	3.0
Stanzhikimi Lake Road – km 4	2.5	4,600	15	3.0
– km 6	1.1	5,000	20	1.0

Table 9. Other forest insects.

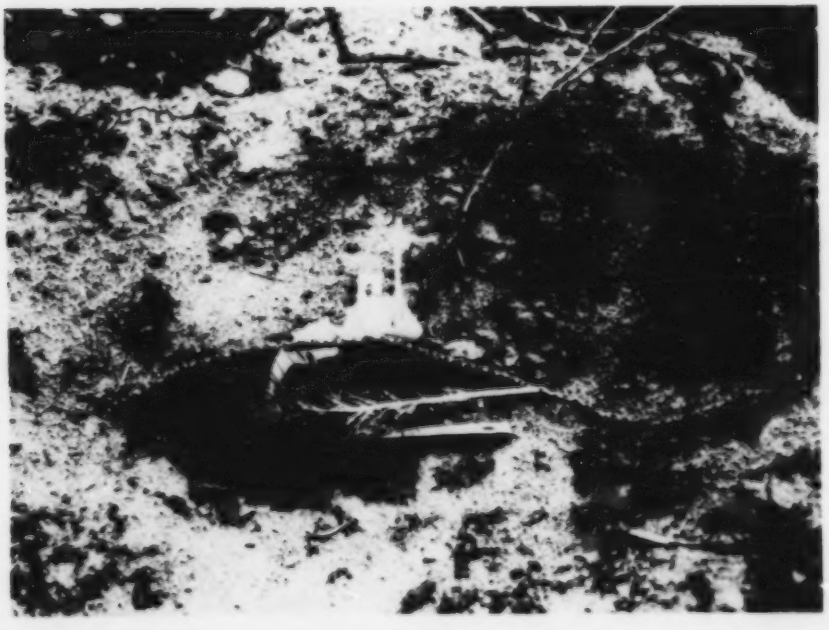
Insect	Host(s)	Remarks
Aphrophora cribrata (Wlk.) Pine spittlebug	jP	This insect was recorded at a high incidence level (100%) causing low levels of damage to 20-m-tall jack pine trees in a 0.5-ha stand along the McConnel Lake road, Boys Township, Kenora District. Trace populations were also observed on 2- to 5-m fringe trees in the vicinity of the English River in Ignace District, along the Burma Lake Road in Sioux Lookout District and along the Pine-ridge Road in Red Lake District.

(cont'd)

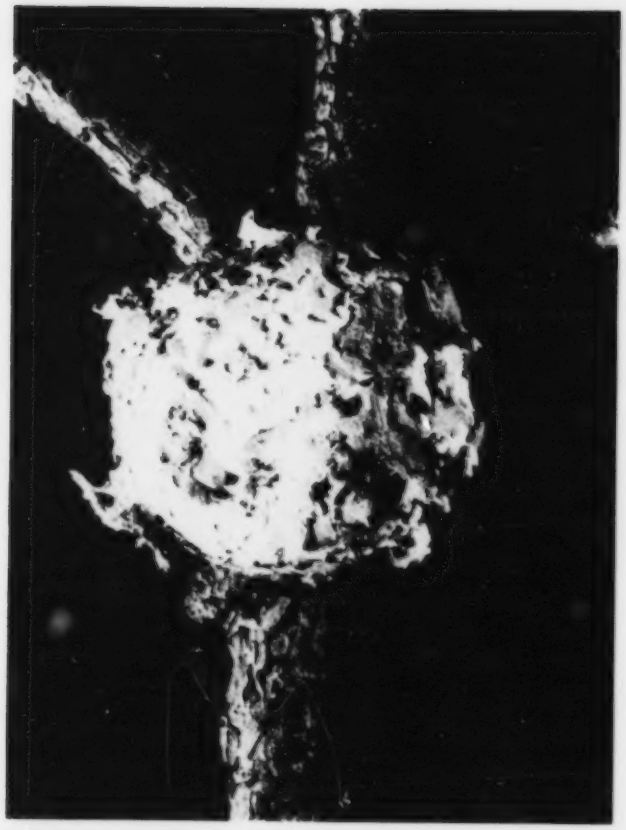
Table 9. Other forest insects (concl.).

Insect	Host(s)	Remarks
Datana ministra (Drury) Yellownecked caterpillar	Ma	This caterpillar was found causing approximately 40% defoliation on two ornamental flowering crab (*Malus* sp.) trees in the town of Sioux Lookout, Sioux Lookout District.
Fenusa pusilla (Lep.) Birch leafminer	wB	This leafminer caused severe browning of ornamentals in the towns of Sioux Lookout and Ignace in the Sioux Lookout and Ignace districts, respectively. Moderate (40%) foliar damage was commonly noted on fringe trees (4 m tall) along Highway 17 at Raven Lake in Ignace District.
Malacosoma californicum pluviale (Dyar) Northern tent caterpillar	wB, pCh	Commonly noted on 1- to 2-m roadside trembling aspen and pin cherry (*Prunus pensylvanica* L.f.) regeneration, causing 20 to 100% defoliation, throughout the region.
Pristophora erichsonii (Htg.) Larch sawfly	tL	Trace numbers of this sawfly were detected on several 8-m roadside trees, causing 2 to 3% defoliation, along Highway 17 at Raven Lake in Ignace District.

Severe defoliation of trembling aspen (*Populus tremuloides* Michx.) caused by the forest tent caterpillar (*Malacosoma disstria* Hbn.) in Sioux Lookout District.



Grasshopper damage to jack pine (*Pinus banksiana* Lamb.) seedlings at the Vermilion River Road seed orchard in Sioux Lookout District.



Main-stem gall on a juvenile jack pine (*Pinus banksiana* Lamb.) caused by the western gall rust fungus (*Endocronartium harknessi* [J.P. Moore] Y. Hirats.).

Typical damage to trembling aspen (*Populus tremuloides* Michx.) caused by the shoot blight fungus (*Venturia macularis* [Fr.] E. Müller & v. Arx).

TREE DISEASES

Major Diseases

Armillaria Root Rot,
Armillaria ostoyae (Romagn.) Herink

Twenty-two randomly selected pine regeneration sites were evaluated across the region to determine the current rate of whole-tree mortality caused by this root-rot fungus. At least 100 trees were examined at each site. The survey confirmed a positive incidence at 27% of the sites, with a corresponding current mortality rate of 1.1%. The highest mortality rate (2.7%) was found in a 12-ha stand of 1.6-m jack pine along the North Fowler Lake road in Sioux Lookout District (Fig. 8).

A complete list of the locations surveyed and the results of the survey are presented in Table 10.

Tar Spot Needle Cast,
Davisomycella ampla (J. Davis) Darker

A single pocket of significant damage was detected along Highway 516 at the Fowler Lake Road in Sioux Lookout District. In a 20-ha regeneration area of 5-m jack pine, 100% of the trees in a pocket approximately 3-ha in size sustained foliar losses amounting to 20%. At the center of this infection, seven trees were found to be severely affected, with 30% of their current shoots killed by the disease.

Elsewhere, trace infection and damage levels (averaging 1%) were recorded on 3-m trees at Goodie Lake in Sioux Lookout District and on 4-m trees at the English River in Ignace District.

Western Gall Rust,
Endocronartium harknessii (J.P. Moore) Y. Hirats.

Twenty-one sites with juvenile jack pine averaging 2 to 6 m in height were evaluated across the region to determine the incidence of branch or stem galls caused by this rust fungus. Trees with a main-stem gall or with more than 25% of their main branches affected were considered to be severely affected. More than 85% of the sites were affected by this rust. The incidence rate of the disease averaged 15.2% across the survey, with 9.0% of the trees severely affected (Fig. 9).

The highest incidence and damage rates were recorded in Sioux Lookout District. The five stands examined in this district were all found to be infected, with an average infection rate of 35.0% and a severely affected rate of 14.0%. The heaviest infection rate (63.0%) was found in a 12-ha stand of 5.0-m-tall trees near Discovery Lake along Highway 642. In a 25-ha stand at the junction of the Fowler Lake Road and Highway 516, the highest incidence of severely affected trees (27%) was recorded. In this stand, 53% of the 4-m-tall trees were affected.

Table 11 lists all the locations surveyed and summarizes the complete data.

Minor Diseases

Leaf Blight,
Septoria betulae Pass.

This leaf-blight fungus was again commonly observed causing high levels (70–80%) of foliar damage on clumps of young white birch (*Betula papyrifera* Marsh.) throughout the Red Lake, Sioux Lookout and Ignace districts. Damage was typically confined to the lower third of the crown and the incidence rate averaged between 10 and 20% in the affected areas.

The highest incidence noted occurred on 7- to 10-m-tall white birch growing throughout the central portion of Sioux Lookout District. General surveys indicated that 90% of the trees examined sustained foliar losses of 30 to 75%.

Septoria Leaf Spot,
Mycosphaerella populicola G.E. Thompson
and **Linospora Leaf Blight,**
Linospora tetraspora G.E. Thompson

These two leaf fungi were commonly encountered either singly or in concert damaging balsam poplar (*Populus balsamifera* L.) throughout the entire region. Typically, small pockets (< 1 ha) of 10- to 15-m mature and semimature trees along highway corridors were observed sustaining infection rates >75% with foliar damage levels averaging 20 to 100%.

The most notable damage occurred along Highway 11 west of the town of Fort Frances, Fort

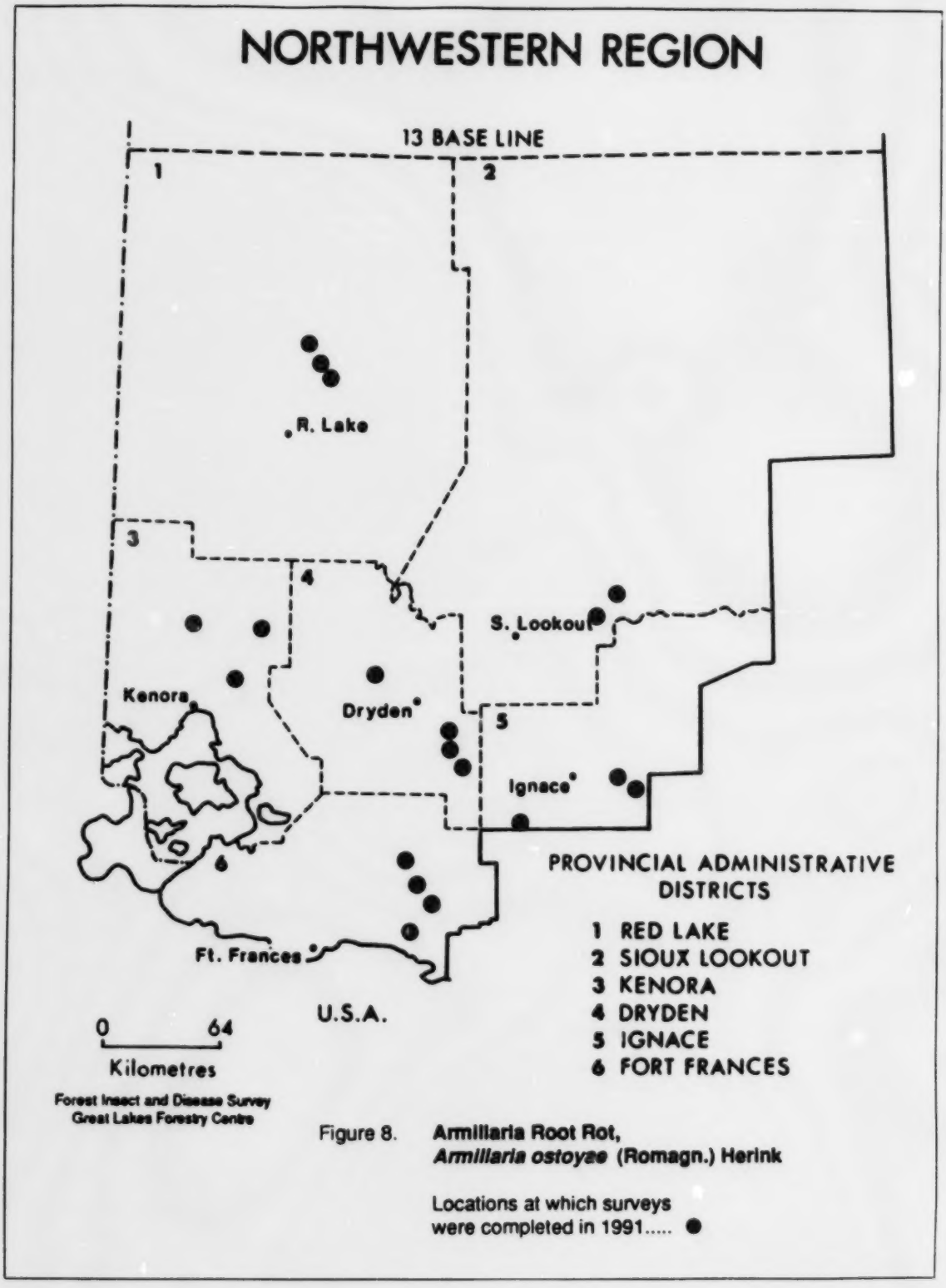


Figure 8. **Armillaria Root Rot, *Armillaria ostoyae* (Romagn.) Herink**

Locations at which surveys were completed in 1991..... ●

Table 10. Damage caused by Armillaria root rot at 22 pine regeneration areas in the Northwestern Region of Ontario in 1991 (counts based on an examination of a minimum of 100 randomly selected trees at each location).

District (Location)	Tree species	Average height of trees (m)	Estimated number of trees per ha	Estimated area of stands (ha)	Trees affected (%)
Dryden District					
Snake Bay Road – km 6	jP	3.0	2,500	8	0.0
– km 33	jP	4.5	1,000	1	0.0
– km 42	jP	4.4	2,100	4	0.0
Mafeking Township	jP	3.5	1,450	9	0.0
Fort Frances District					
Highway 502 – Kenozhe Road	jP	3.9	900	2	0.0
Mount Road	jP	1.9	5,200	6	1.0
Glengarry Road – km 16	jP	4.9	1,000	4	0.0
– Turtle River	jP	4.0	1,300	1	0.0
Ignace District					
Sowden Lake Road	jP	3.5	4,200	15	0.0
Megikon Road – km 8	jP	2.1	3,800	10	0.0
Highway 622 – Atikokan border	jP	1.9	5,400	15	0.7
Kenora District					
Ulster Lake Road – km 2	jP	2.9	1,330	2	0.0
– km 9	jP	2.3	7,500	3	0.0
McMeeken Township	jP	4.0	2,500	2	0.0
English River Road	jP	4.0	2,200	2	0.7
Desmond Township	jP	3.4	4,100	4	0.0
Red Lake District					
Coli Lake	jP	2.3	5,200	20	0.0
Coli Lake	jP	2.2	5,400	25	0.0
Anderson Lake	jP	2.0	4,000	15	1.3
Sioux Lookout District					
Fowler Lake Road North	jP	1.6	5,200	12	2.7
Kathlyn Lake Road	rP	1.0	3,000	10	0.7
Stanzikimi Road – km 4	jP	2.5	4,600	15	0.0

Frances District, and along Highway 72 south of the town of Sioux Lookout and Highway 664 east of the town of Hudson, Sioux Lookout District. At these locations, an incidence rate of 100% with foliar loss exceeding 90% was commonly encountered in 0.25-ha pockets of host trees. Similar incidence rates, but with lower foliar damage levels (40–60%), were evident throughout Rugby Township in Dryden District and Haycock Township in Kenora District. This level of damage was also recorded along Highway 105 in the Ear Falls area of Red Lake District and Highway 599 north of the town of Ignace in Ignace District.

Shoot Blight of Aspen,
Venturia macularis (Fr.:Fr.) E. Müller & v. Arx

Damage to the leaders of aspen regeneration was routinely observed across large portions of the region. In the southern half of the Red Lake and Sioux Lookout districts, 60 to 70% of the 1- to 2-m-tall regeneration commonly sustained 10 to 50% shoot loss. Widespread damage was also noted across the Ignace, Kenora and Fort Frances districts; however, both incidence and shoot damage rates were significantly lower, averaging <10% and 1% respectively.

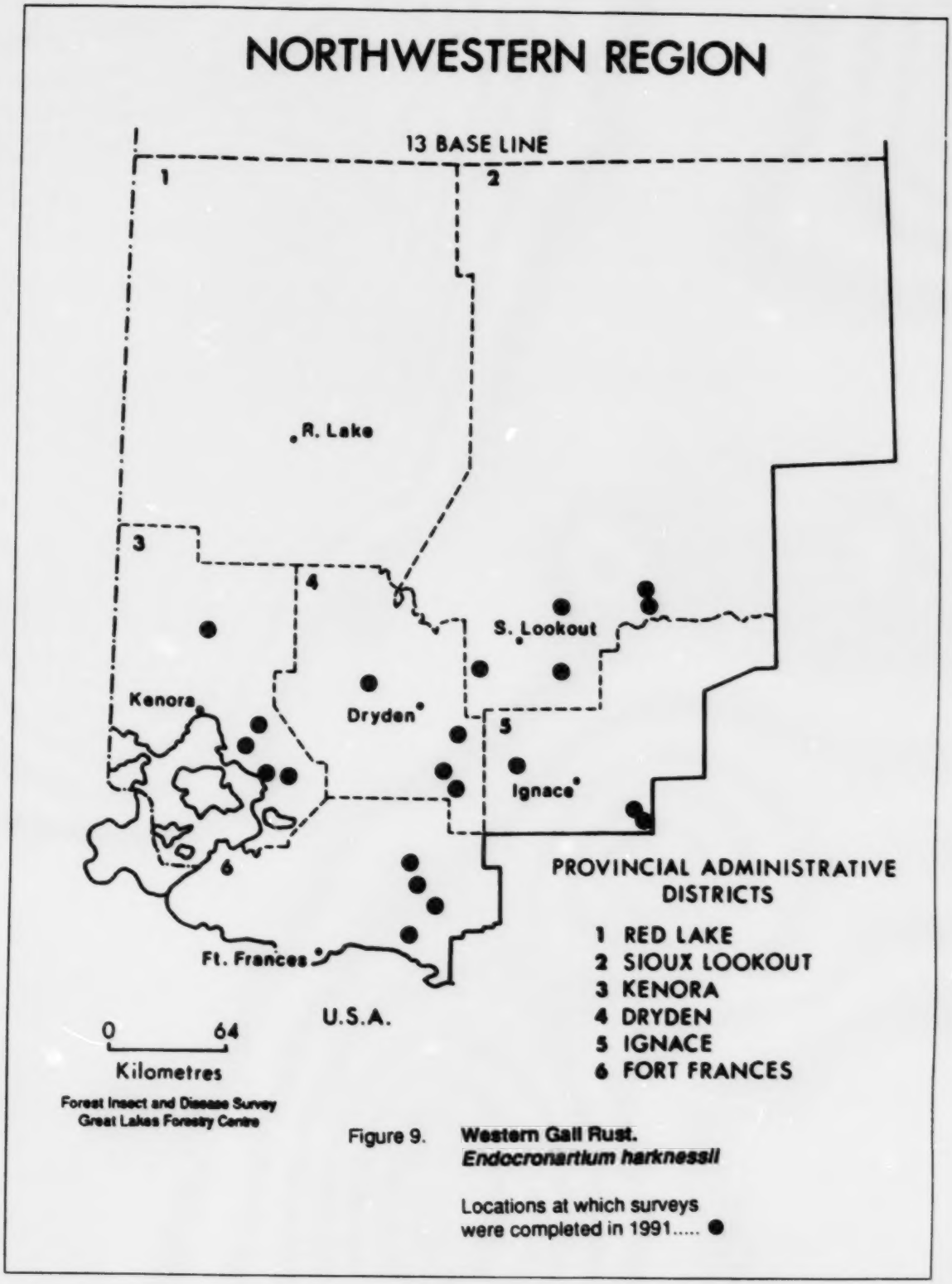


Figure 9. **Western Gall Rust.**
Endocronartium harknessii

Locations at which surveys were completed in 1991..... ●

Table 11. Damage caused by the western gall rust in jack pine regeneration at 21 locations in the Northwestern Region of Ontario in 1991 (counts based on an examination of 150 randomly selected jack pine at each location).

District (Location)	Average height of trees (m)	Number of trees per ha	Estimated area affected (ha)	Trees affected (%)	Trees severely affected (%)
Dryden District					
Snake Bay Road – km 6	3.0	2,500	8	3.0	2.0
– km 33	4.5	1,000	1	3.0	0.0
– km 42	4.4	2,100	4	1.0	0.0
Mafeking Township	3.5	1,450	9	5.0	0.0
Fort Frances District					
Highway 502 – Kenozhe Road	3.9	900	2	1.0	0.0
Mount Road	1.9	5,200	6	0.0	0.0
Glengarry Road – km 16	4.9	1,000	4	7.0	2.0
– Turtle River	4.0	1,300	1	10.0	3.0
Ignace District					
Sowden Lake Road	3.5	4,200	15	6.0	3.0
English River	5.0	3,300	12	31.0	7.0
Raleigh Lake	6.0	2,500	7	28.0	8.0
Kenora District					
Ulster Lake Road – km 2	2.9	1,330	2	0.0	0.0
– km 9	2.3	7,500	3	0.0	0.0
McMeeken Township	4.0	2,500	2	2.0	0.0
English River Road	4.0	2,200	2	1.0	0.0
Desmond Township	3.4	4,100	4	1.0	0.0
Sioux Lookout District					
Highway 516 – Fowler Lake Road	4.0	3,600	25	11.0	2.0
– Fowler Lake Road	4.0	3,600	25	53.0	27.0
Burma Lake Road	4.0	4,000	15	27.0	12.0
Highway 642 – Discovery Lake	5.0	2,700	12	63.0	14.0
Goodie Lake Road	3.0	3,000	25	53.0	27.0

Table 12. Other forest diseases.

Disease	Host(s)	Remarks
Hypoxylon mammatum (Wahlenb. [P. Karsten]) Hypoxylon canker	tA	Hypoxylon canker was recorded on 36% of the 12-m trees in a 1-ha pocket along Highway 664 east of the town of Hudson in Sioux Lookout District. At Raleigh Lake in Ignace District, <1% of the 12-m trees were affected in a 2-ha stand.
Leucostoma Nivea (Hoffm.: Fr.) Höhnel Cytospora canker	tA	Cytospora canker caused mortality of several 7.5-m trees along the English River in Ignace District.
Phellinus tremulae (Bondartsev) Bondartsev & Borisov White trunk rot	tA	This fungus was commonly detected in stands throughout the region. Collections were made in four districts and the infected trees were often found to have several fruiting bodies on their main stems.
Uncinula sp. Powdery mildew	bPo	Foliar damage levels of 20% caused by this fungus were recorded in a small (<0.5 ha) pocket of poplar regeneration in Zealand Township, Dryden District.

ABIOTIC DAMAGE

Blowdown

Severe winds were a major cause of timber loss in the region in 1991. Numerous single trees were uprooted and blown over as a result of severe thunderstorms. However, the most significant damage occurred on 18 July, when two separate windstorms caused severe damage to large tracts (207,715 ha) of standing timber.

The largest area, comprising some 164,685 ha, extends from the southern arm of Umfreville Lake in Kenora District, northeast over the Sydney and Conifer lakes area, across Longlegged Lake and ending at Dixie Lake west of Pakwash Lake in Red Lake District (Fig. 10). The damage amounted to 55,155 ha in Kenora District and 109,530 ha in Red Lake District. Immediately to the north of this area, two smaller pockets were detected along the southern and western shores of Gullrock Lake in Red Lake District, totaling an additional 2,240 ha. The timber in the area of blowdown was primarily mature to overmature jack pine and black spruce with pockets of spruce–fir and trembling aspen. This large area of damage represents a significant loss of timber to forest management in these two districts.

A second storm on the same day accounted for a string of small, scattered pockets of damage in the Dryden, Ignace and Sioux Lookout districts, totaling some 40,790 ha. The damage extended from the Dryden–Wabigoon area of Dryden District eastward along the Sioux Lookout–Ignace district boundary to Watcomb Lake in Sioux Lookout District. Total damage in each district was as follows: Sioux Lookout District, 13,190 ha; Ignace District, 19,985 ha; and Dryden District, 7,615 ha. Before these storms, much of the affected area had been harvested and only lake reserve timber was left. This reserve timber consisted mainly of spruce–fir stands, with balsam fir being the main component at many locations. Following the logging, the eastern spruce budworm killed most of the residual timber; hence, the actual timber loss due to wind was minimal. However, in the Dryden and Wabigoon areas, damage to buildings and ornamental trees was extensive.

These two storms also caused damage at two of the seed orchards in the region. At the Vermeersch black spruce orchard, approximately 18% of the trees were either completely blown over or left leaning to such an extent that root damage was evident. Similar damage was also recorded on 10.7% of the trees at the Beauregard Lake black spruce orchard in Red Lake District.

Drought

Drought-stressed and drought-killed trees were commonly encountered at numerous locations throughout the entire region. Although the damage was widespread, no large, continuous areas of dead or dying trees were detected. Damage was usually confined to a single tree or small clumps of five to 10 trees growing on rocky shorelines, shallow-soil sites or gravel ridge tops.

Jack pine was the single most commonly encountered tree species that was seriously affected, often resulting in whole-tree mortality. White birch, a second common tree species on these sites, was also affected, but to a lesser extent. The drought caused leaf discoloration of white birch by early August and premature leaf drop by late August; however, no branch or whole-tree mortality was recorded.

This is the third consecutive year that drought damage has been reported in the Northwestern Region of Ontario. Weakened trees may take as long as 3 years to succumb to the effects of drought. These stressed trees are often attacked by such pests as bark beetles (Family Scolytidae), and wood borers (families Buprestidae and Cerambycidae), which add to the rate of decline. Dying jack pine were examined at several locations in the Fort Frances, Ignace and Sioux Lookout districts and it was determined that bark beetles and woodborers were present in the trees, thus contributing to the rate of decline. The full impact of 3 years of drought may ultimately have significant impact on the forests of Northwestern Ontario.

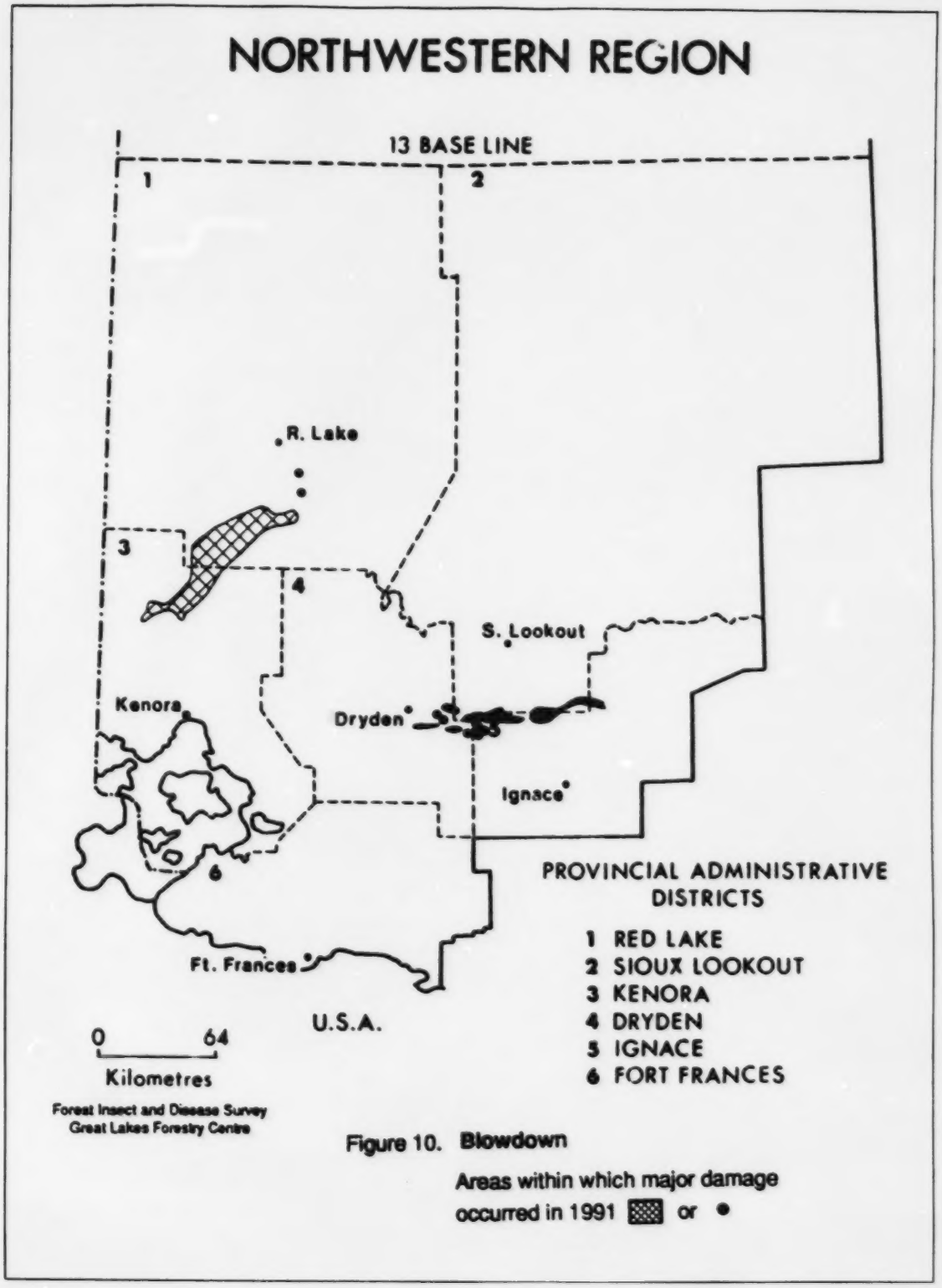


Figure 10. **Blowdown**

Areas within which major damage occurred in 1991 ▨ or ●

Hail Damage

Two areas of hail damage were detected in the region in 1991. A 100-ha area of 15-m-tall jack pine south of Entwine Lake in Fort Frances District sustained various levels of foliar damage. It was determined that 95% of the trees lost from 10 to 90% of their total foliage. Five percent of the 2-m juvenile jack pine in a 30-ha cutover in the Stanzhikimi Lake area of Sioux Lookout District sustained similar foliar damage. At this location, some 90% of the young trees also sustained damage to their main stems. The bark had been split and pieces, several millimetres in size, were completely removed. At both locations, branch and whole-tree mortality will probably be encountered next season.

FOREST HEALTH

Acid Rain National Early Warning System (ARNEWS)

The annual evaluation of the three ARNEWS plots in the region once again did not detect any signs or symptoms of foliar damage on the plot trees caused by airborne pollutants. Extensive examinations of the crowns of the plot trees and their stems revealed damage caused only by insect and disease pests that are common and widespread throughout the region.

At the Sandel Lake black spruce plot in Sioux Lookout District, the eastern spruce budworm was detected on 100% of the black spruce trees, causing low-to-moderate levels of current defoliation. Four percent of the jack pine in the plot were each infested with a single colony of jack pine sawflies, causing <1% defoliation, and an additional 2% were infested with bark beetles (*Ips* sp.). Wind whipping of fine branches resulted in twig mortality on approximately 40% of the plot trees. This damage resulted from severe thunderstorms late in the summer of 1990 and throughout the summer of 1991.

In the jack pine plot in Mafeking Township, Dryden District, the western gall rust was found on approximately 65% of the trees, causing low levels of branch mortality. The jack pine in the Dance Township, Fort Frances District, plot were free of any evidence of abiotic pests, but three of the five trembling aspen in the plot were found to have fruiting bodies of a common poplar stem fungus, possibly a species of *Phellinus*.

SPECIAL SURVEYS

Annual Seed Orchard Survey

The summer of 1991 marked the second year of the annual seed orchard survey across Northwestern Region. Eight orchards, four white spruce and four black spruce, were monitored in order to contribute to the continued development of an inventory of insect and disease problems in the seed orchards. All orchards were evaluated twice during the season to ensure maximum coverage of pest problems. The following is a brief summary of pest problems encountered during the surveys. The complete list of pests and the data collected are presented in Tables 13a and 13b.

The eastern spruce budworm was present in all orchards, and ranged in incidence from a low of 6.6% at the Glatz–Rugby white spruce orchard in Dryden District to a high of 99.0% at the Skurband Lake black spruce orchard in Sioux Lookout District. However, defoliation levels caused by this pest did not exceed 2.0% at any of the orchards. The white pine weevil was detected causing leader damage at three locations, with the highest incidence rate (7.3%) occurring at the Manion Lake white spruce orchard in Fort Frances District.

Trace levels (<1.3%) of Armillaria root rot were detected in five of the orchards, with similarly low current mortality rates. Although the incidence of Armillaria root rot is very low, this organism is having a major impact on the orchards by killing 1 to 2% of the crop trees annually. Spruce needle rust (*Chrysomyxa ledi* [Alb. & Schwein.] de Bary var. *ledi*) was detected only at the Dawe white spruce orchard in Ignace District, affecting 48.7% of the trees and causing 1.5% defoliation.

Noteworthy pests encountered in the orchards but not contained in the standard list of pests evaluated at each site included the spruce broom rust (*Chrysomyxa arctostaphyli* Dietel), which affected

Table 13a. Damage in four white spruce seed orchards in the Northwestern Region of Ontario in 1991 (results based on an examination of 150 randomly selected trees at each location).

	Dryden	Fort Frances	Ignace[a]	Red Lake
	Glatz–Rugby	Manion Lake	Dawe	Bawlb Lake
Average height (m)	1.0	1.8	1.6	0.6
Area (ha)	4	8	11	8
Trees/ha	400	333	400	400
Spruce budworm: trees affected (%)	6.6	8.0	86.0	30.0
Spruce coneworm: trees affected (%)	0.0	0.6	0.0	0.0
Defoliation by budworm/coneworm (%)	1.0	2.0	NA	1.0
Yellowheaded spruce sawfly: trees affected (%)	0.0	12.0	NA	0.0
defoliation (%)	0.0	4.0	NA	0.0
Monochamus sp.: trees affected (%)	0.0	0.0	0.0	0.0
White pine weevil: leaders affected (%)	0.0	7.3	2.0	0.0
Zeiraphera sp.: trees affected (%)	0.0	0.0	0.0	0.0
Frost injury: trees affected (%)	7.3	38.0	0.0	0.0
foliar damage (%)	3.0	3.0	0.0	0.0
Armillaria root rot: trees affected (%)	0.0	0.0	1.3	0.0
Current mortality: trees affected (%)	0.0	0.0	1.3	0.0
Needle rust: trees affected (%)	0.0	0.0	48.7	0.0
foliar damage (%)	0.0	0.0	1.5	0.0
Tip blight: trees affected (%)	0.0	0.0	0.0	0.0
Cone rust: trees affected (%)	0.0	0.0	0.0	0.0
Chlorosis: trees affected (%)	0.0	0.0	0.0	3.3

[a] NA = data unavailable because of feeding by forest tent caterpillar larvae.

Table 13b. Damage in four black spruce seed orchards in the Northwestern Region of Ontario in 1991 (results based on an examination of 150 randomly selected trees at each location).

	Kenora		Red Lake	Sioux Lookout
	Minnesabic	Ulster	Beauregard	Skurban Lake
Average height (m)	2.5	2.5	3.1	2.6
Area (ha)	5	5	5	5
Trees/ha	3,100	3,200	3,200	3,200
Spruce budworm: trees affected (%)	7.3	39.3	96.0	99.0
Spruce coneworm: trees affected (%)	0.0	0.0	0.0	0.0
Defoliation by budworm/coneworm (%)	1.0	1.0	1.0	1.0
Yellowheaded spruce sawfly[a]: trees affected (%)	0.0	0.0	0.0	0.0
defoliation (%)	0.0	0.0	0.0	0.0
Monochamus sp.: trees affected (%)	0.0	0.0	1.3	2.7
White pine weevil: leaders affected (%)	1.3	0.0	0.0	0.0
Zeiraphera sp.: trees affected (%)	0.0	0.0	14.7	99.0
defoliation (%)	0.0	0.0	1.0	1.0
Frost injury: trees affected (%)	0.0	0.0	0.0	0.0
foliar damage (%)	0.0	0.0	0.0	0.0
Armillaria root rot: trees affected (%)	1.3	0.6	0.7	0.7
Current mortality: trees affected (%)	0.6	0.6	0.7	0.7
Needle rust: trees affected (%)	0.0	0.0	0.0	0.0
foliar damage (%)	0.0	0.0	0.0	0.0
Tip blight: trees affected (%)	0.0	0.0	0.0	0.0
Cone rust: trees affected (%)	0.0	0.0	0.0	0.0

[a] *Pikonema alaskensis* (Roh.)

2.0% of the black spruce trees at Skurband Lake. The pine needle scale (*Chionaspis pinifoliae* [Fitch]) was found infesting 2.0% of the black spruce examined at the Minnesabic orchard in Kenora District. Forest tent caterpillar larvae caused severe defoliation of adjacent poplar (*Populus* spp.) stands at two orchards, and as these stands became denuded of foliage, the starving immature larvae then migrated into the orchards searching for food. At the Dawe white spruce orchard in Ignace District, this resulted in 90% of the trees sustaining 60% current defoliation and at the Glatz–Rugby orchard, 15% of the white spruce trees sustained 6% foliar damage.

Diplodia tip blight (*Diplodia* sp.) was documented for the first time in the southern half of the region at the Morson black spruce seed orchard in Fort Frances District. The organism was not detected during the standard 150-tree evaluation; however, it was collected during a subsequent routine visit. The damage was confined to the southeastern portion of the orchard, in which 2% of the orchard trees were affected; of these, 50% were dead and the remainder averaged 5% branch mortality. This organism is often detected fruiting on the 2-year-old cones of affected trees, therefore a separate assessment of these cones was conducted. The entire sample of 100 cones proved to be free of the fungus. This was similar to the results of surveys conducted at infected orchards in Sioux Lookout District in 1989. To date, this organism has never been recovered from black spruce cones. The OMNR timber staff in Fort Frances District hand-clipped and removed infected branches and completely removed all dead trees in an effort to con-trol the spread of the disease throughout the orchard.

The severe windstorm that occurred in the region on 18 July also caused damage at the Beauregard Lake black spruce orchard in Red Lake District. An evaluation of the orchard after the storm revealed that 10.7% of the trees were either blown over completely or left leaning to such an extent that root damage was evident. The majority of these trees will probably die during the spring and early summer of 1992.

Egg-mass sampling for the purpose of forecasting eastern spruce budworm population levels was conducted at four of the eight orchards. Severe defoliation is forecast for 1992 in the Skurban Lake orchard, whereas the remaining three orchards revealed no evidence of the pest. However, light defoliation from this pest may still occur at these orchards. The forecast of severe defoliation at the Skurban Lake orchard may have a significant impact on the cone and seed production for 1992, as this pest will readily feed on the flowers and immature cones, thus destroying a large proportion of the crop.

OMNR timber staff hand-clipped leaders infested by the white pine weevil at the Skurban and Manion Lake orchards and ground-sprayed the Glatz–Rugby orchard with the chemical insecticide Malathion in an effort to control the eastern spruce budworm. Post-spray surveys revealed < 1% defoliation caused by the budworm in this orchard.

Additional Seed Orchard Surveys

In conjunction with the annual seed orchard survey an additional seven orchards were surveyed to detect any evidence of pest problems. A standard 150-tree evaluation was completed at each orchard and the results of these surveys are presented in Tables 14a and 14b. The following is a brief summary of the results.

The eastern spruce budworm was once again the most commonly encountered pest. It was present in all but one of the seven orchards at varied incidence levels (16–99%) but caused low levels of actual defoliation. The highest incidence of infested trees occurred at the Goodie Lake North orchard in Sioux Lookout District, where 99.0% of the trees were infested; however, defoliation levels were only 1%. The highest defoliation level (7%) occurred at the Aubrey orchard in Dryden District, where 72.0% of the trees were infested. White pine weevil populations were found to be generally low in the orchards; the highest incidence rate (2.7%)

Table 14a. Results of a seed orchard survey conducted at seven locations in the Northwestern Region of Ontario in 1991 (counts based on an examination of 150 randomly selected trees at each location).

District (Location)	Tree species	Estimated stand area (ha)	Estimated number of trees per ha	Average height of trees (m)	Tip blight		Armillaria root rot	Frost	
					Trees affected (%)	Average defoliation per tree (%)	Trees affected (%)	Trees affected (%)	Average defoliation per tree (%)
Dryden District									
Aubrey	bS	3	625	2.0	0.0	0.0	0.0	0.0	0.0
Melgund	bS	5	3,000	2.3	0.0	0.0	0.0	0.0	0.0
Fort Frances District									
Morson	wS	8	270	1.2	0.0	0.0	0.0	11.0	1.0
Ignace District									
Ferguson	bS	10	3,200	2.7	0.0	0.0	0.0	0.0	0.0
Kenora District									
High Lake	wS	10	625	1.0	0.0	0.0	0.0	0.0	0.0
Sioux Lookout District									
Goodie Lake North	bS	5	3,000	2.8	0.0	0.0	0.0	0.0	0.0
Goodie Lake South	bS	5	3,000	3.3	0.0	0.0	0.0	0.0	0.0

Table 14b. Results of a seed orchard survey conducted at seven locations in the Northwestern Region of Ontario in 1991 (counts based on an examination of 150 randomly selected trees at each location).

District (Location)	Tree species	Estimated stand area (ha)	Estimated number of trees per ha	Average height of trees (m)	Spruce budworm		White pine weevil	Yellowheaded spruce sawfly	
					Trees affected (%)	Average defoliation per tree (%)	Leaders attacked (%)	Trees affected (%)	Average defoliation per tree (%)
Dryden District									
Aubrey	bS	3	625	2.0	72.0	7.0	2.0	3.0	4.0
Melgund	bS	5	3,000	2.3	16.0	1.0	0.6	0.0	0.0
Fort Frances District									
Morson	wS	8	270	1.2	0.0	0.0	0.6	0.0	0.0
Ignace District									
Ferguson	bS	10	3,200	2.7	28.7	1.0	0.0	0.0	0.0
Kenora District									
High Lake	wS	10	60	1.0	4.0	3.0	0.0	0.0	0.0
Sioux Lookout District									
Goodie Lake North	bS	5	3,000	2.8	99.0	1.0	2.7	0.0	0.0
Goodie Lake South	bS	5	3,000	3.3	34.0	1.0	1.3	0.0	0.0

was found at Goodie Lake north. The yellow-headed spruce sawfly (*Pikonema alaskensis* [Roh.]) was encountered only at the Aubrey orchard, at low incidence and damage levels.

Neither Diplodia tip blight nor Armillaria root rot were detected at all locations surveyed. The absence of the tip blight is significant because four orchards were seriously affected in 1990. The control operations conducted by OMNR at the affected orchards have proven to be successful. Frost damage was found at the Morson white spruce orchard in Fort Frances District, where 11% of the trees sustained 1% foliar damage.

Pests that were encountered during these surveys but that are not listed in tables 14a and 14b included the eastern pine shoot borer, which was found damaging 0.6% of the white spruce at the High Lake orchard in Kenora District. The spruce bud moth (*Zeiraphera canadensis* Mut. & Free.) was recorded causing trace damage levels on black spruce at both the Goodie Lake North and South orchards. The pine needle scale (*Chionaspis pinifoliae* [Fitch]) was found on 6.0% of the black spruce at Goodie Lake north and 1.3% at Goodie Lake South; damage was <1.0% at both orchards. The spruce bark beetle (*Scolytus piceae* [Swaine]) was collected from a single tree killed by Armillaria root rot at the Goodie Lake North orchard. The spruce broom rust (*Chrysomyxa arctostaphyli* Dietel) was detected on 0.7% of the trees at the Goodie Lake North orchard.

Egg-mass sampling for the purpose of forecasting defoliation levels of the eastern spruce budworm in 1992 was conducted at four of the seven orchards. Both of the Goodie Lake orchards have forecasts of moderate-to-severe defoliation in 1992, whereas the Melgund and Ferguson orchards have a forecast of no defoliation. However, these two orchards may still experience light defoliation in 1992. The forecasts of high levels of defoliation at the Goodie Lake orchards could have a significant impact on cone and seed production in 1992, as budworm larvae will feed extensively on the developing flowers and immature cones.

OMNR timber staff hand-clipped and destroyed leaders infested by the white pine weevil at the black spruce orchards at Goodie Lake and Morson. At the Melgund orchard, three applications of the insecticide Methoxychlor were applied in mid-May by ground sprayers in an attempt to control the white pine weevil. Surveys later in the season suggest this control operation was successful, as <1% of the leaders were found to be damaged by the white pine weevil.

Spruce Seed and Cone Pests

At least 25 green cones were collected from each of nine seed orchards surveyed in 1991. The presence, identity and attributable damage for each pest encountered are quantified in Table 15.

The most frequently encountered damage was attributed to feeding by larvae of the eastern spruce budworm on the exterior of the juvenile cones. The spruce cone maggot (*Lasiomma anthracinum* [Czerny]), which feeds along the axis of the cone, was the second most common pest encountered. The cone axis midge (*Dasineura rachiphaga* Tripp) was prominent at the Ferguson seed orchard in Ignace District and the larvae of an unidentified coneworm (*Dioryctria* sp.) were detected hollowing out significant numbers of cones at the Minnesabic seed orchard in Kenora District. Also recorded at the Minnesabic orchard was mechanical damage to cones, possibly caused by wind or hail.

Gypsy Moth Pheromone Traps

Pheromone traps were once again set out at 10 locations in the region in 1991; nine of these were in provincial parks and the tenth was at Minaki Lodge in Kenora District. At each location, the traps were set out in late June, prior to the flight of the adult male gypsy moth (*Lymantria dispar* [L.]). Male moths had been trapped last season at several provincial parks: Blue Lake in Dryden District, Caliper Lake in Fort Frances District and Sioux Narrows in Kenora District. To provide better information, 10 traps were set out in 1991 at each of

these parks. This level of surveillance was considered to be warranted to ensure that infestations of this potentially harmful pest were not building un- detected in the parks. At the remaining seven locations, two traps were put in place during the same time period.

Two parks disclosed positive results this season, at Blue Lake Provincial Park for the second consecutive year, and for the first time at Pakwash Provincial Park in Red Lake District. A single male moth was captured at each location.

The results of the trapping program for the past 2 years and the locations trapped are presented in Table 16.

Table 15. Pests found damaging green cones at nine seed orchards in the Northwestern Region of Ontario in 1991 (at least 25 cones were collected at each location).

District (Location)	Tree species	Damaged cones (%)	Principle cause of cone damage and proportion attributed to each pest (%)	
Dryden District				
Glatz–Rugby	wS	24.0	Lepidoptera	100.0
Fort Frances District				
Manion Lake	wS	8.0	*Lasiomma anthracinum*	100.0
Ignace District				
Ferguson	bS	28.0	Lepidoptera	57.0
			Lasiomma anthracinum	14.0
			Dasineura rachiphaga	29.0
Kenora District				
Minnesabic Lake	bS	32.0	Lepidoptera	25.0
			Lasiomma anthracinum	51.0
			Dioryctria spp.	12.0
			Mechanical	12.0
Ulster	bS	11.0	*Lasiomma anthracinum*	100.0
Red Lake District				
Beauregard Lake	bS	15.0	Lepidoptera	50.0
			Lasiomma anthracinum	50.0
Sioux Lookout District				
Skurban Lake	bS	44.0	Lepidoptera	100.0
Goodie Lake North	bS	20.0	Lepidoptera	100.0
Goodie Lake South	bS	36.0	Lepidoptera	88.0
			Lasiomma anthracinum	12.0

Table 16. Results of the gypsy moth pheromone trapping program at 10 locations in the Northwestern Region of Ontario in 1990 and 1991.

District (Location)	Number of pheromone traps deployed	Number of male moths captured	
		1990	1991
Dryden District			
Aaron Prov. Park	2	0	0
Blue Lake Prov. Park	10	2	1
Fort Frances District			
Caliper Lake Prov. Park	10	1	0
Lake of the Woods Prov. Park	2	0	0
Ignace District			
Sandbar Lake Prov. Park	2	0	0
Kenora District			
Rushing River Prov. Park	2	0	0
Sioux Narrows Prov. Park	10	1	0
Minaki Lodge	2	0	0
Red Lake District			
Pakwash Prov. Park	2	0	1
Sioux Lookout District			
Ojibway Prov. Park	2	0	0

Forest Tree Nursery Report

Monthly inspections of the Dryden District tree nursery disclosed only one significant widespread insect pest this season, the white pine weevil. Approximately 5% of the 0.9-m-tall trees examined in the white spruce seed orchard sustained various amounts of damage to leaders and laterals, ranging from 5 to 95%, from larval feeding by this pest.

Abiotic problems caused considerable damage in numerous seedbeds across the entire nursery. Winter drying was recorded on red pine seedlings in compartment C1–A, where seedlings in three of the nine beds sustained tissue breakdown above the soil line on 54% of all seedlings examined. The damage varied widely (from 25 to 75%), and included 3% mortality at the time of assessment. Winter drying also resulted in a 5–15% foliar loss in the eastern white cedar (*Thuja occidentalis* L.) hedges that surround many of the compartments. Hail damage was detected on black spruce seedlings in four compartments. An assessment in one of the affected compartments (E–9) revealed that an average of 10% of the seedlings were dead or dying.

Moderate levels (26–75%) of foliar damage on various-aged ornamental tamarack (*Larix laricina* [Du Roi] K. Koch) growing in a discrete hollow were diagnosed as suffering from spray drift of herbicide from the adjacent nursery compartments.

Climatic Data

Seasonal variations in the normal weather patterns have a direct effect on both biotic and abiotic conditions, as do sudden and extreme changes in weather. Monitoring daily weather conditions also permits an accurate predication of the emergence of overwintering larvae of some of the major forest pests. For these reasons, the FIDS Unit maintains daily and monthly averages of weather conditions for numerous locations across the province. Table 17 summarizes the weather data for 1991 provided by three Atmospheric Environment Service weather offices in the Northwestern Region of Ontario. The "normals" quoted were taken directly from the Canadian Climate Normals for Ontario from 1951 to 1980.

Table 17. Mean temperature and total precipitation at three locations in the Northwestern Region of Ontario in 1991.

Location	Month	Mean temperature (°C)		Deviation from normal (°C)	Total precipitation (mm)		Deviation from normal (%)
		Actual	Normal		Actual	Normal	
Fort Frances Airport	January	–16.9	–18.0	–1.1	30.6	35.0	+4.4
	February	–13.1	–9.0	+4.1	22.7	33.0	+10.3
	March	–5.7	–4.2	+1.5	31.6	16.5	–15.1
	April	3.8	6.6	+2.8	48.5	66.9	+18.4
	May	11.0	14.3	+3.3	71.2	89.7	+18.5
	June	16.4	18.7	+2.3	101.7	131.8	+30.1
	July	19.2	18.8	–0.4	103.6	61.1	–42.5
	August	17.7	19.7	+2.0	82.6	19.6	–63.0
	September	12.2	11.4	–0.8	83.8	147.5	+63.7
	October	6.6	3.6	–3.0	50.9	48.3	–2.6
	November	–3.2	–6.3	–3.1	36.8	69.8	+33.0
	December	–12.4	–10.7	+1.7	31.8	41.0	+9.2
Sioux Lookout Airport	January	–19.4	–20.6	–1.2	36.0	40.3	+4.3
	February	–15.7	–11.9	+3.8	26.8	11.3	–15.5
	March	–8.3	–5.5	+2.8	35.0	26.9	–8.1
	April	1.4	–3.6	–2.2	45.2	76.8	+31.6
	May	9.2	13.1	+3.9	65.8	81.9	+16.1
	June	15.2	18.9	+3.7	91.7	142.8	+51.1
	July	18.3	18.4	+0.1	93.7	183.8	+90.1
	August	16.6	19.2	+2.6	88.3	65.0	–23.3
	September	10.7	10.1	–0.6	81.6	222.6	+141.0
	October	4.7	1.8	–2.9	64.9	46.2	–18.7
	November	–5.3	–9.0	–3.7	49.9	87.1	+37.2
	December	–15.1	–13.7	+1.4	33.7	35.8	+2.1
Kenora Airport	January	–18.5	–19.5	–1.0	28.2	25.2	–3.0
	February	–14.4	–10.4	+4.0	23.0	30.6	+7.6
	March	–7.1	–5.0	+2.1	30.1	27.1	–3.0
	April	2.7	6.5	+3.8	41.9	60.6	+18.7
	May	10.5	14.3	+3.8	57.3	85.4	+28.1
	June	16.1	19.2	+3.1	83.4	94.4	+11.1
	July	19.2	19.2	0.0	91.8	116.4	+24.6
	August	17.6	20.8	+3.2	85.9	20.8	–65.1
	September	11.7	11.2	–0.4	69.2	143.3	+74.1
	October	5.6	2.4	–3.2	40.7	60.8	+20.1
	November	–4.6	–8.4	–3.8	40.4	57.3	+16.9
	December	–14.1	–12.1	+2.0	31.2	30.7	–0.5

Appendix 1. Northwestern Region – Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1991, and infestation forecasts for 1992.

Location	Host	Estimated defoliation in 1991 (%)	Number of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1992[a]	Accumulated damage[b]
Dryden District (19 locations)					
Aerobus Lake	bF	52	166	M–S	2
Aubrey Township	bF	63	426	S	2
Beaverhouse Lake	bF	42	133	M–S	3
Brownridge Township	bF	48	706	S	2
Cedar Lake	bF	42	66	M	2
Cliff Lake	bF	39	336	S	1
Eagle Lake – East side	bF	38	501	S	5
Forest Lake	bF	69	929	S	2
Ingall Lake	bF	29	401	S	2
Melgund Seed Orchard	bS	2	0	N	0
– near Seed orchard	bF	18	93	M–S	1
Mutrie Township – Eagle River	wS	17	2,599	S	2
Rugby Township	bF	32	386	M–S	2
Southworth Township	bF	8	56	M	1
Tadpole Lake	bF	38	95	M–S	5
Tustin Township	bF	6	28	L–M	1
Wapageisi Lake	bF	68	0	N	5
Washeibemaga Lake	bF	30	185	M–S	3
Zealand Township – Aaron Prov. Park	bF	35	916	S	2
Fort Frances District (17 locations)					
Bear Pass	bF	15	236	M–S	1
Boffin Lake	bF	18	344	S	1
Claxton Township – Caliper Lake Prov. Park	bF	57	489	S	1
Entwine Lake	bF	9	0	N	1
Eric Lake	bF	8	43	L–M	1
Jackfish Lake	bF	79	284	S	3
Kawawia Lake	bF	7	0	N	2
Lower Manitou Lake	bF	27	90	M–S	1
Manion Lake Seed Orchard	bS	2	0	N	0
– near Seed Orchard	bF	2	41	L–M	0
Morson Seed Orchard	bS	2	0	N	0
– near Seed Orchard	bF	2	0	N	0
Pipestone Lake	bF	32	137	M–S	7
Potts Township	bF	12	38	L–M	0
Rainy Lake – Ash Bay	bF	8	0	N	1
Shoal Lake	bF	55	1,508	S	2
Vickers Lake	bF	6	0	N	9
Ignace District (23 locations)					
Barrel Lake	bF	49	124	M–S	3
Basket Lake	bF	68	375	S	7
Bell Lake	bF	97	187	M–S	5
Bertrand Township	bF	14	111	M–S	1
Campus Lake	bF	14	0	N	–
Cecil Lake	bF	17	36	L–M	7

(cont'd)

Appendix 1. Northwestern Region – Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1991, and infestation forecasts for 1992 (cont'd).

Location	Host	Estimated defoliation in 1991 (%)	Number of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1992[a]	Accumulated damage[b]
Ignace District (concl.)					
Dewan Township	bF	82	238	M–S	4
Ferguson Seed Orchard	bS	1	0	N	1
– near Seed Orchard	bF	32	84	M	5
Indian Lake	bF	12	135	M–S	7
Kin Lake	bF	85	286	S	5
Kukukus Lake	bF	19	221	S	7
Phyllis Lake	bF	85	328	S	7
Sandbar Lake Prov. Park – Stand 740	bF	73	778	S	6
Selwyn Lake	bF	77	223	M–S	5
Shikag Lake	bF	72	55	M	5
Smirch Lake	bF	19	0	N	+
Sturgeon Lake – Granite Bay	bF	78	434	S	5
– North Arm	bF	42	356	S	4
Tag Lake Road	bF	77	247	M–S	2
Vermeersch Seed Orchard	bS	3	27	L–M	1
– near Seed Orchard	bF	77	497	S	5
Vista Lake	bF	64	604	S	4
Kenora District (22 locations)					
Cameron Lake – Stand 265	bF	29	208	M–S	1
Chase Lake	bF	86	128	M–S	3
Cygnet Lake	wS	27	1,221	S	2
English River Road – Stand 8	bF	50	377	S	2
Forgie Township – Rush Bay Road	bF	54	579	S	2
Lennan Lake	bF	60	274	S	2
Mayburn Road – Stand 102	bF	44	67	M–S	1
Maynard Lake	bF	71	156	M–S	3
McGeorge Township – Sioux Narrows	bF	30	214	M–S	1
Minnesabic Lake Seed Orchard	bS	2	0	N	0
– near Seed Orchard	bF	60	664	S	2
Paintpot Lake	bF	95	77	M–S	3
Pelican Township – Pelican Pouch Lake	bF	18	100	M–S	5
Pellatt Township – Sandy Lake	bF	27	589	S	1
Rushing River Prov. Park	bF	7	32	L–M	0
Sand Lake	bF	61	96	M–S	2
Snowshoe Lake	bF	56	495	S	2
Stephen Lake – Stand 220	bF	21	82	M–S	2
Toothpick Lake	bF	51	1,387	S	3
Umfreville Lake	bF	76	1,038	S	2
Ulster Seed Orchard	bS	2	0	N	0
– near Seed Orchard	bF	25	0	N	1
Red Lake District (21 locations)					
Baird Township	bF	75	1,030	S	4
Bateman Township – East Bay	bF	34	210	M–S	3

(cont'd)

Appendix 1. Northwestern Region – Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1991, and infestation forecasts for 1992 (cont'd).

Location	Host	Estimated defoliation in 1991 (%)	Number of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1992[a]	Accumulated damage[b]
Red Lake District (concl.)					
Beauregard Lake Seed Orchard	bS	0	0	N	1
– near Seed Orchard	bF	17	0	N	4
Birch Lake – South Bay	bF	68	383	S	3
Chukuni Lake Road	bF	51	102	M–S	3
Confederation Lake	bF	97	1,'84	S	5
Ear Falls	bF	50	302	S	3
Earngey Township	bF	94	339	S	6
Flundra Lake	bF	93	137	M–S	5
Lac Seul – Farewell Bay	bF	58	452	S	5
Lietch Lake	bF	100	812	S	7
McDonough Township	bF	71	263	S	4
Murdock Lake	bF	73	869	S	3
Narrow Lake	bF	93	747	S	5
Nungesser Road – Stand 67	bS	2	0	N	3
– Stand 76	bS	5	0	N	4
Pakwash Prov. Park – Group Camping	bF	94	775	S	4
– Trailer Camp	bF	20	137	M–S	3
Unexpected Lake	bF	28	158	M–S	5
Whitemud Lake	bF	97	679	S	4
Sioux Lookout District (24 locations)					
Aerofoil Lake	bF	12	25	L–M	1
Big Sandy Lake	bF	21	598	S	7
Carling Lake	bF	10	11	L	1
Deception Lake	bF	42	246	M–S	3
Drayton Township – Abram Lake	bF	78	898	S	4
Goodie Lake Seed Orchard					
– North	bS	5	92	M–S	1
– South	bS	1	88	M–S	1
– near Seed Orchard	bF	68	219	S	3
Jackknife Lake	bF	58	287	S	4
Kimmewin Lake – Stand 410	bF	64	337	S	3
Lac Seul – Black Bay	bF	41	189	M–S	5
– Coons Bay	bF	56	261	S	2
– Merritt Bay	bF	68	196	M–S	3
– Whitefish Bay	bF	57	229	M–S	4
– Windigo Point	bF	47	258	S	6
Mascara Lake	bF	88	1,028	S	3
Ojibway Prov. Park – Entrance	bF	75	113	M–S	4
– Terry Lake Trail	bF	58	286	S	4
Savant Lake – NE Arm	bF	20	276	S	1
Skurban Lake – Seed Orchard	bS	1	163	S	1
– near Seed Orchard	bF	36	276	S	4

(cont'd)

Appendix 1. Northwestern Region – Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1991, and infestation forecasts for 1992 (concl.).

Location	Host	Estimated defoliation in 1991 (%)	Number of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1992[a]	Accumulated damage[b]
Sioux Lookout District (concl.)					
Sunlight Lake	bF	70	378	S	5
Wapesi Lake – Stand 470	bF	28	566	S	1
Wapesi River	bF	37	21	L–M	3

[a] S = severe, M = moderate, L = light, N = nil

[b] Accumulated Damage: 0 = undamaged; 1 = light damage, <25% total defoliation, usually one season of severe defoliation; 2 = moderate damage, 25 to 60% total defoliation, two or three seasons of severe defoliation; 3 = severe damage, 60 to 80% total defoliation, three to five seasons of severe defoliation, will recover; 4 = moribund or dying, 80 to 100% total defoliation, crowns gray in appearance, 50–150 cm top dead or bare; 5 = <25% of stand dead; 6 = 25 to 50% of stand dead; 7 = 50 to 70% of stand dead; 8 = >70% of stand dead; 9 = <25% of stand dead, no significant (0–25%) defoliation for several years; + = 25 to 50% of stand dead, no significant defoliation for several years; – = 51 to 70% of stand dead, no significant defoliation for several years.

Appendix 2. Northwestern Region – Jack Pine Budworm: Summary of defoliation estimates and egg-mass counts in 1991 and infestation forecasts for 1992 on jack pine.

Location	Estimated % defoliation in 1991	Total number of egg masses on six 61-cm branch tips	Infestation forecasts for 1992[a]
Dryden District (3 locations)			
Mutrie Township – Impact Plot	2	0	N
Redvers Township – Stand 51	2	2	L
Zealand Township – Tree nursery	2	0	N
Ignace District (5 locations)			
Dasent Lake	52	10	H
Kay Lake	19	2	L
McNevin Township – Encamp Lake Road	6	0	N
Pipio Lake	28	3	M
Ruxton Lake	25	6	H
Kenora District (4 locations)			
Coyle Township	9	1	L
Gundy Township	2	0	N
Kirkup Township	2	0	N
Redditt Township	3	0	N
Red Lake District (18 locations)			
Borel Lake	66	19	H
Coli Lake – north	33	3	M
– south	33	3	M
Kirkness Lake	48	24	H
Little Vermilion Lake – Stand 36	19	2	L
– Stand 61	12	5	M
– Stand 333	49	2	L
– Stand 341	40	8	H
Madden Lake	38	1	L
Nungesser Lake	72	7	H
Nungesser River – Stand 162	10	1	L
Offer Lake	10	3	M
Perrigo Lake	5	0	N
Rathouse Lake – Stand 310	58	7	H
Reigate Lake	65	0	N
Silcox Lake	48	0	N
Wagin Lake	50	7	H
Woody Lake	52	6	H
Sioux Lookout District (5 locations)			
Aerial Lake	46	0	N
Aerofoil Lake	13	0	N
Deaddog Lake	10	0	N
Goodie Lake	70	2	L
Papaonga Lake	12	2	L

[a] N = nil, L = light, M = moderate, H = heavy